21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

Exam.	**Regular**		
Level	BE	Full Marks	80
Programme	BEI., BEX, BME, BIE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

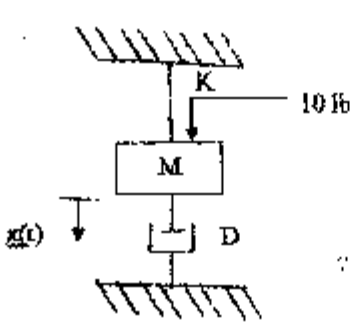
Subject: - Control System *(EE602)*

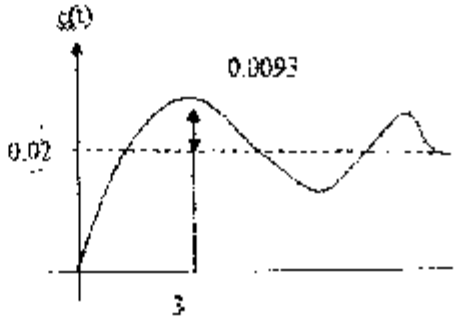
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Construct a general block diagram of a control system showing the different blocks, variables and hence briefly point out their meaning. [4]

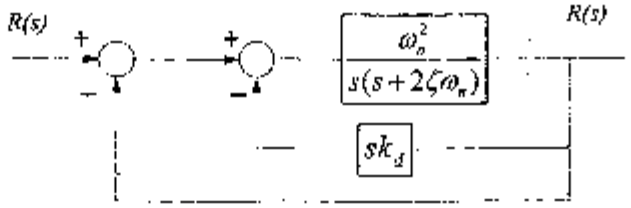
b) Effect of disturbance in case of feedback control system can be suppressed by increasing the gain G(S) and / or H(S). [4]

c) Following figure shows a mechanical vibratory system and the response when 10 lb of force is applied to the system. Determine the transfer function and value of M, D and K. The displacement x is measured from the equilibrium position. [8]

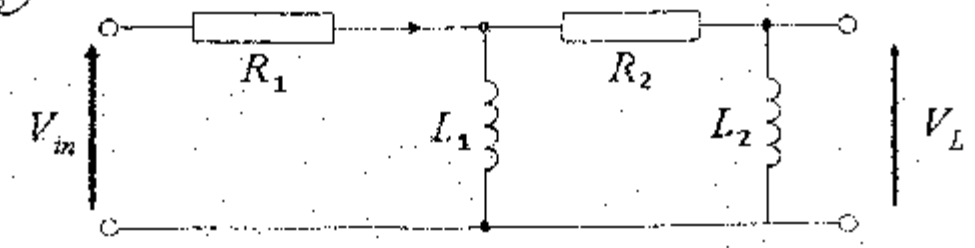




2. a) Show that using the velocity feedback techniques shown figure below damping ratio and steady state error are both increased. [8]



b) Develop block diagram model for the system below. [6]



c) Using R-H criteria, tell how many roots of polynomial is in right half s-plane, in left half s-plane and on jw axis and also comment on stability. [4]

$S^6 + 3S^5 + 4S^4 + 6S^3 + 5S^2 + 3S + 2 = 0$

3. a) For the unity feedback system with open loop transfer function (OLTF) $G(s) = \frac{k}{(s+1)(s+3)}$, use angle criteria to check whether the root locus passes from point $s_d = -2 + j3.5$. If yes, use magnitude criteria to select the appropriate value of gain parameter. [4]

b) For a system given by $\frac{d}{dt}\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} -5 & -6 \\ 1 & 0 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u; y = \begin{bmatrix} 1 & 2 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$, determine the zeros and the poles of the system. [4]

c) The open loop transfer function of a control system is given by [8]

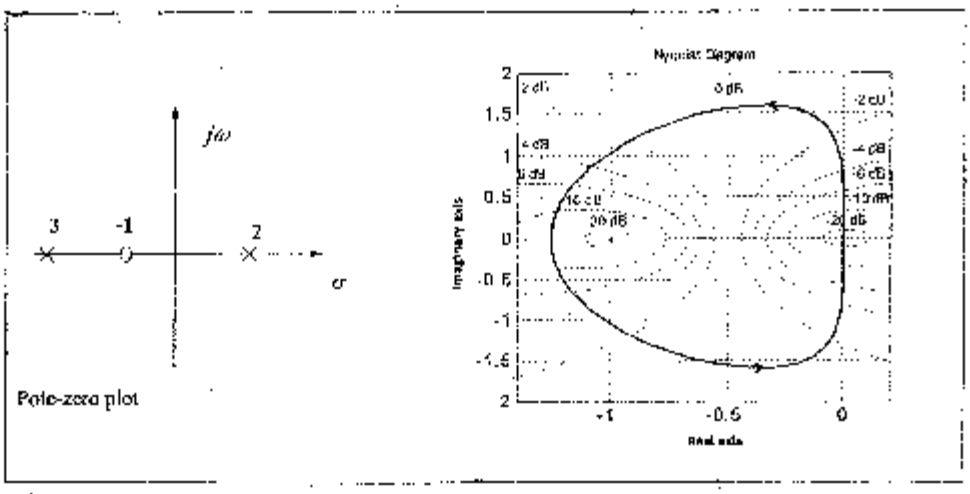
$$G(s)H(s) = K\frac{s^2 - 2s + 5}{s^2 + 1.5s - 1}$$

Sketch the root locus for $0 < K \leq \infty$ and determine the breakaway point, the angle of departure from complex poles and the stability conditions. Also find value of K that gives poles at $(-0.35 \pm j0.6)$

4. a) Design a suitable compensator for a unity feedback system with open loop transfer $G(s) = \frac{4}{s(s+2)}$ such that the settling time will become 2 seconds without change in overshoot and velocity time constant will be $2\ s^{-1}$. [12]

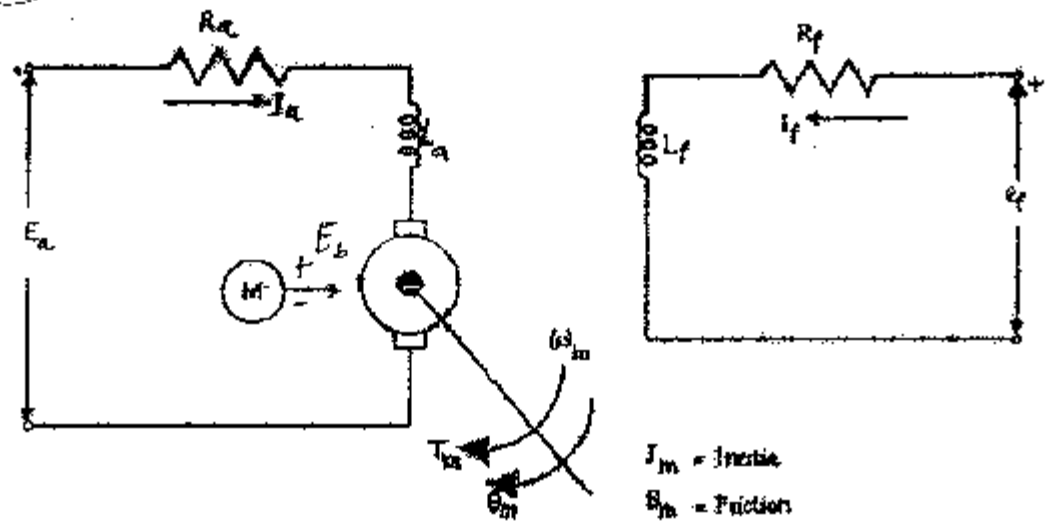
b) For a compensator transfer function given by $G_c(s) = \frac{s+\tau}{s+a\tau}$, give the condition of lead compensator. For the given value of 'a' what is the frequency that leads to maximum phase angle lead. [4]

5. a) State the Nyquist stability criteria for negative feedback control system. Using this concept determine whether the following system represented by figure below is stable. [4]



b) Discuss how bode plot can be used to determine transfer function of the system. [5]

c) Develop state equation for motor circuit at below. [5]



***

2071 chaitra

control system

22 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Shawan

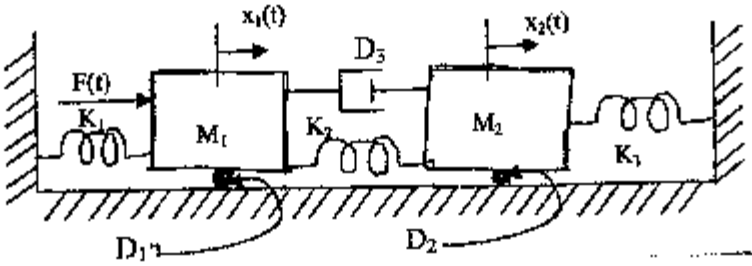
Exam.	New Back (2066 & Later Batch)		
Level	BE	**Full Marks**	80
Programme	BEL, BEX, BME, BIE	**Pass Marks**	32
Year / Part	III / I	**Time**	3 hrs.

Subject: - Control System *(EE602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) What is control system? Draw the block diagram of a closed loop control system and briefly explain the function of each block. Mention also advantages of closed loop system over open loop system. [8]

   b) Find the transfer function, $\frac{X2(S)}{F(S)}$, for the mechanical system of figure below. Also draw the F-V and F-I analogy circuit of the system. [8]



2. a) Discuss how the dynamic responses of control system are affected by a feed back. [6]

   b) For an open loop transfer function with unity feedback $G(S)=\frac{\omega_n^2}{s(s+2\xi\omega_n)}$ where $\xi < 1$, derive an expression for output when unit step input is applied. [4]

   c) Using R-H criteria, tell how many roots of polynomial is right half s-plane, in left half s-plane and on jw axis. [6]
   $S^6+2S^5+8S^4+12S^3+20S^2+16S+16=0$

3. a) The open loop transfer function of a control system is given by
   $$G(S)H(S)=\frac{K}{s(s+6)(s^2+4s+13)}$$
   Sketch the root locus for $0 \le K \le \infty$ and determine the breakaway point, the angle of departure from complex poles and the stability conditions. [10]

   b) Discuss how a Bode plot can be used to determine transfer function of the system. Explain with an example. [6]

4. a) Construct the polar plot of unity feedback system with $G(S)=\frac{K}{S(S+1)(0.1S+1)}$.
   Then, upgrade the plot to make it. Nyquist plot. Hence find range of k for stable operation. [3+3+2]

   b) For given state equation and output equation, find transfer function $\frac{Y(S)}{U(S)}$ [8]

$$\dot{X}=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -1 & -2 & -3\end{bmatrix}X+\begin{bmatrix}10\\ 0\\ 0\end{bmatrix}u \quad \text{and} \quad y=[1\ \ 0\ \ 0]X$$

Design a suitable lead compensating network for $G(S)=\frac{k}{s^2(1+0.25s)}$ to meet the following specification $K_a = 10\ sec^{-1}$

$P.M \ge 35^\circ$ [16]

***

21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

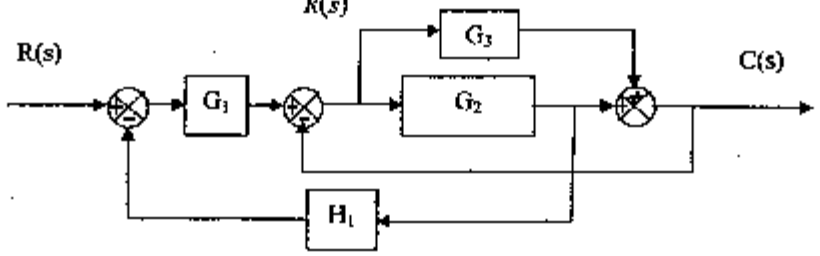
Exam.	**Old Back (2065 & Earlier Batch)**		
Level	BE	**Full Marks**	80
Programme	BEL, BEX, BCT	**Pass Marks**	32
Year / Part	III / I	**Time**	3 hrs.

Subject: - Control System *(EG 648EE)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any **Five** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

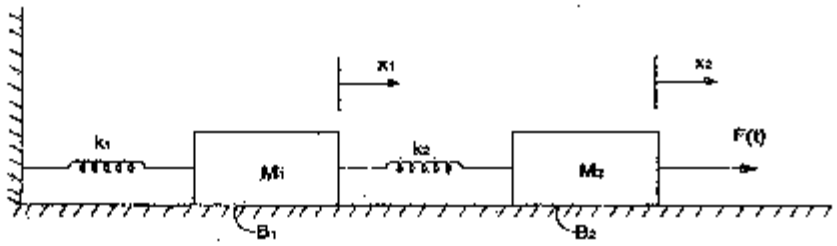
1. a) For armature controlled separately excited DC motor, identify the necessary differential equations governing its behaviors and hence derive the dynamic model of such motor. **[8]**

   b) Determine the transfer function $\frac{C(s)}{R(s)}$ for the following system. **[8]**

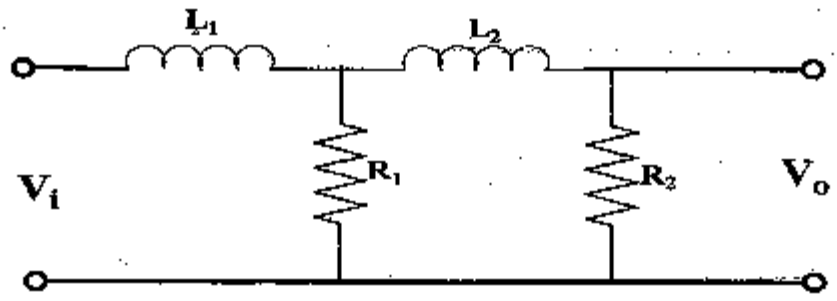


2. a) Draw the free body diagram, write the differential equations and find the mentioned transfer function of the below **[10]**

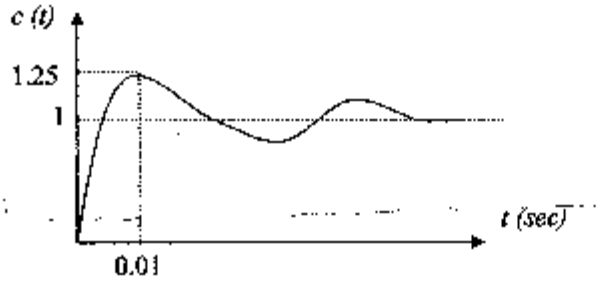
$\frac{X_2(s)}{F(s)}$ and $\frac{X_1(s)}{F(s)}$



   b) Draw the block diagram and reduce it to calculate $\frac{V_0(s)}{V_i(s)}$ for the following network. **[6]**



3. a) The unit step response of a linear control system is shown in figure below. Find the transfer unction of a second order system to model the system. [8]

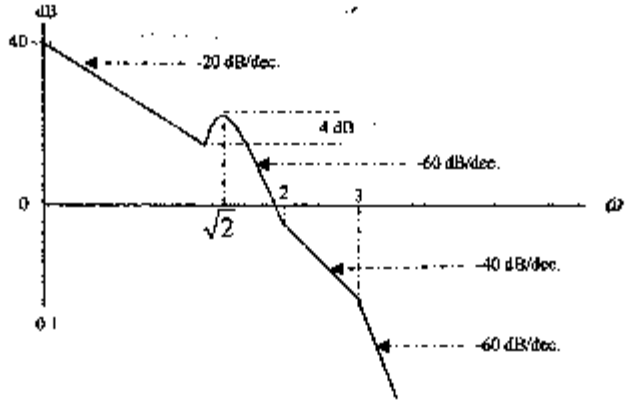


b) Check the stability of the system represented by the following characteristic equation given below using R-H criteria. [8]

$s^4+8s^3+18s^2+16s+50=0$

4. a) Find the Gain Margin and Phase Margin using Bode plots for the following transfer function: $G(s)=\dfrac{1}{s(0.1s+1)(0.2s+1)}$ [8]

b)An engineer is called in to consult on a control system in a piece of equipment in the field. No one can find the design report or test results from the original design of control system. The engineer therefore decided to take a frequency response of the system. The resulting asymptotic frequency response is obtained as below. Determine the transfer function. [8]



5. a) Draw the Nyquist plot for the following open loop transfer function [10]

$G(s).H(s)=\dfrac{(s+2)}{s(s+1)(s+3)}$

b) Discuss in brief the use of PID controllers in control system. [6]

6. A system of which open loop transfer function $G_f(s)=\dfrac{4}{s(s+2)}$. It is desired to design a compensator so that the static velocity error constant K_v is 20sec^{-1}, Phase margin is at least 50° and gain margin is at least 10db. [16]

***

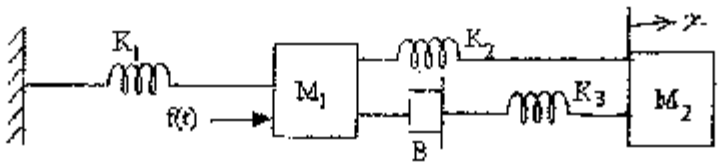
21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

Exam.	**Regular**		
Level	BE	**Full Marks**	80
Programme	BEL, BEX,BME,BIE	**Pass Marks**	32
Year / Part	III / I	**Time**	3 hrs.

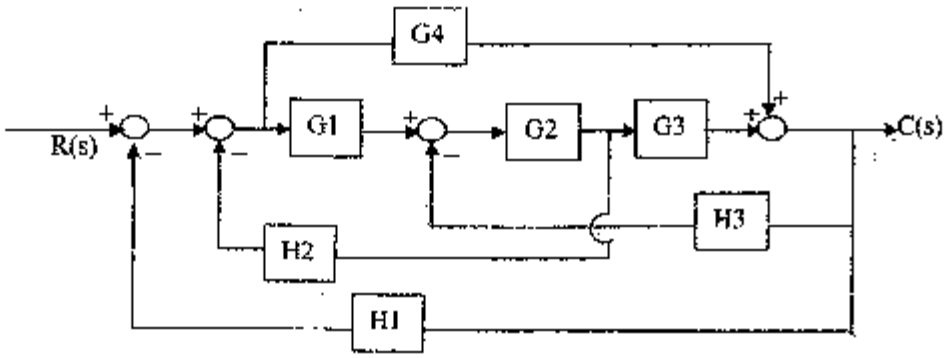
Subject: - Control System *(EE602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. (a) Find transfer function for the following mechanical system considering displacement of mass M_2 as output of the system. Also develop force current analogous circuit. [6]

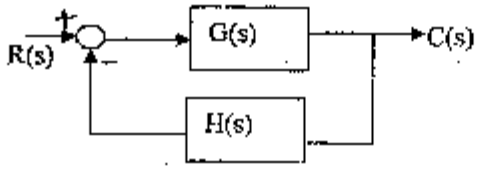


(b) Reduce the following block diagram model to obtain its overall transfer function. [6]



(c) How can you characterize a control system in term of (i) Speed (ii) accuracy (iii) Stability explain. [4]

2. (a) For a second order system as below $G(s) = \frac{w_n^2}{s(s+2\xi w_n)}$ and H(s) =1, find expression for maximum overshoot on its unit step response where w_n is natural frequency of oscillation and ξ is damping ratio at underdamped situation. [7]



(b) Discuss how a feed back control system reject the disturbance input. [3]

(c) Find all static error constant for a unity feedback system with feedforward transfer function $G(s) = \frac{1000}{s(s+10)(s+100)}$. Evaluate steady state error if system is excited with r(t) = 2+t. [6]

3. (a) Obtain Nyquist plot and comment on stability using Nyquist Criterion for a unity feedback system with feedforward transfer function $(s) = \frac{(s+2)}{(s+1)(s-1)}$. [8]

(b) Discuss how Bode plot is used for determining relative stability. [4]

(c) Discuss the application of a PI controller with suitable example. [4]

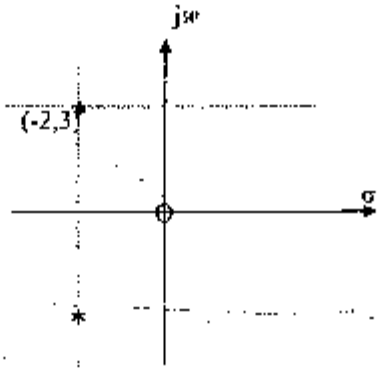
4. (a) Obtain characteristic equation for the system having given state model. [4]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -5 & -1 \\ 3 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 2 \\ 5 \end{bmatrix} u$$

$$Y = \begin{bmatrix} 1 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

(b) Design series lag compensator for the unity feedback system with feedforward transfer function $G(s) = \frac{K}{s(s+4)(s+80)}$. The velocity error constant is $80s^{-1}$ and phase margin at least 33^0. [12]

5. (a) Draw Root Locus for the system that has open-loop pole/zero plot in s-plane as below in figure. Also estimate the system gain at the point where the system exhibits critical damping. [8]



(b) The open loop transfer function of a closed loop system is $(s) = \frac{K(s+1)}{s(s+2)(s+3)}$, find maximum possible K for which the poles lie on left of point -0.5. [8]

***

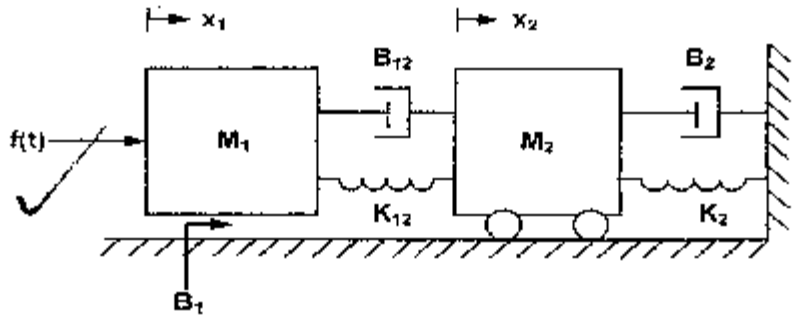
22 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2069 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BME, BIE	Pass Marks	32
Year / Part	III / I	Time	3 hrs

Subject: - Control System *(EE602)*

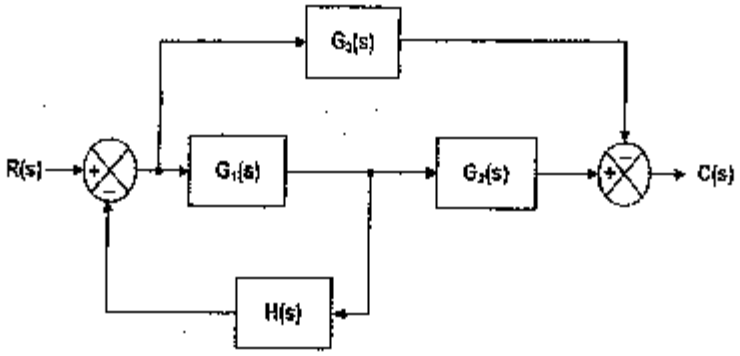
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Bode plot and normal graph paper would be provided.*
- ✓ *Assume suitable data if necessary.*

1. Stating an example of a system that you see in everyday life, explain what do you understand by closed loop system and the importance of feedback in it. [4]
2. Write the differential equations governing the mechanical system shown in figure below and find $\frac{X_2(s)}{F(s)}$. [8+4]



Also tabulating the necessary analogies draw the Force-Current and Force-Voltage electrical analogous circuit.

3. a) Convert the given block diagram to signal flow graph and determine the overall transfer function using Masson's Gain Formula. [6]



b) Consider a unity feedback system with a closed loop transfer function $\frac{C(s)}{R(S)} = \frac{Ks+b}{s^2+as+b}$ [6]

Determine the open loop transfer function G(S). Also compute the steady state error with unit ramp input.

4. The characteristics equation of a system is given by $S^6 + 3s^5 + 4s^4 + 6s^3 + 5s^2 + 3s + 2 = 0$. Comment on the stability. [6]

5. Plot the root loci for closed loop system with $G(S) = \frac{K}{S(S+1)(S^2+4S+5)}$ ....., $H(S) = 1$. Also determine the dominant closed loop pole with $\xi = 0.5$. [12]

6. Draw the bode plot for transfer function $G(S) = \frac{48(1+s)}{(s^2)(1+3s)(1+0.5s)(2+02.s)}$. from the graph determine (i) Phase crossover frequency (ii) Gain crossover frequency (iii) P M (iv) G.M (v) Stability of the system. [10]

7. Design a suitable cascade lag compensator network for the given system $G(s) = \frac{50K}{s(s+5)(s+10)}$ [16]

Such that the requirement of velocity error constant of 30 sec^{-1} and phase margin of $\geq 45°$ are met.

8. A system has the transfer function $\frac{Y(s)}{U(s)} = \frac{2}{s^3+6s^2+11s+6}$ [8]

Find the state and output equation in matrix form and test the controllability and observability of the system.

***

22 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

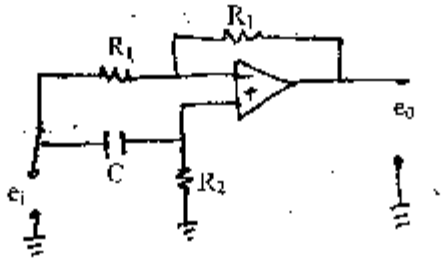
2068 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BME, BIE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Control System *(EE 602)*

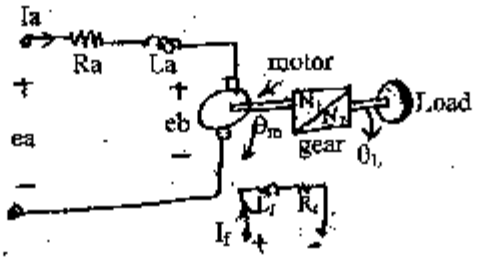
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Find the transfer function $e_0(S)/e_i(s)$ of the given circuit. [6]

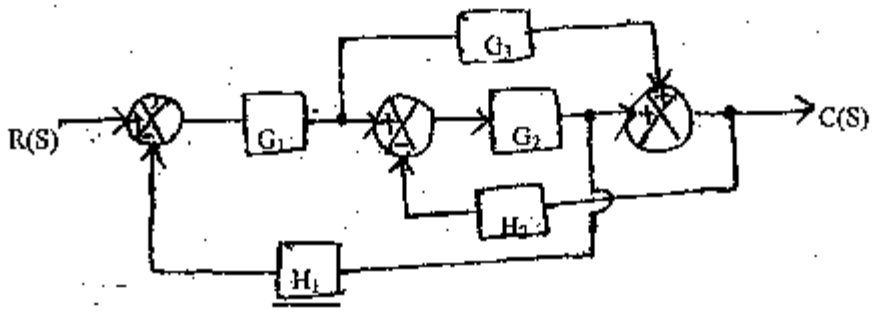


b) For an electromechanical system shown below, derive an expression for $V_L(S)$ considering it as armature controlled dc motor. [10]

Motor: i) Moment of intertia = J_m (ii) Frictional coefficient = D_m (iii) Torsional
Load: i) Moment of intertia = J_m (ii) Frictional coefficient = D_m (iii) Torsional



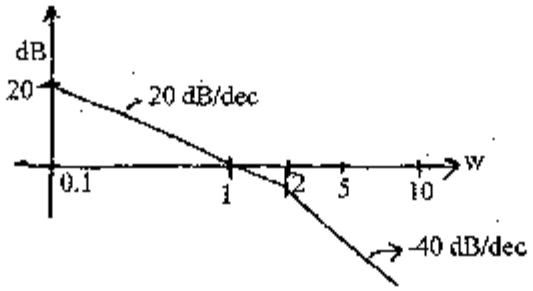
2. a) Determine overall transfer function $\frac{C(S)}{R(S)}$ by block diagram reduction technique. [8]



b) Apply RH criteria to determine the range of 'K' for a unity feedback system with $G(S) = \frac{K(S+13)}{S(S+3)(S+7)}$ will be stable. [8]

3. a) Sketch the root locus for the system having $G(S) = \frac{K(S+1)}{(S^2+2S+2)(S^2+2S+5)}$. [10]

b) Estimate transfer function with the help of following Bode plot. [6]



4. a) Write short notes on following: [4×2]

i) Gain margin and phase margin

ii) PD and PI controller

b) Determine TF for the system whose state space representation is given by: [8]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & -1 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 2 \end{bmatrix} u$$

$$y = [1 \quad 0] \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

5. Design a suitable lead compensator for a system having open loop TF $G(S) = \frac{K}{S(1+0.1S)(1+0.001S)}$ such that the compensated system should have phase margin of at least 45° and static velocity error constant of at least 1000. [16]

***

22 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Baishakh

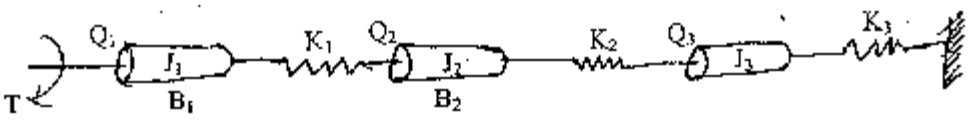
Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Control System

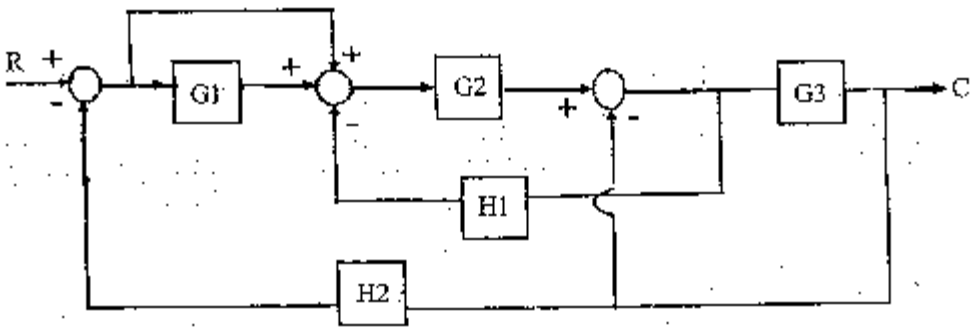
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Semilog graph paper will be provided.***

1. State whether the following statements are true or false and justify them. [(1+3)×4]
   a) Introduction of feedback on the system makes the system response faster.
   b) Effect of disturbances can be reduced by increasing the gain of forward path TF.
   c) Proportional controller makes the steady state error zero.
   d) Derivative controllers are always used with other controllers.

2. a) Write differential equation and obtain transfer function of the mechanical system as shown below considering θ_3 as output. Also draw torque voltage analogy network. [6+2]



   b) Find overall transfer function of the system as shown below by block diagram reduction technique. [8]

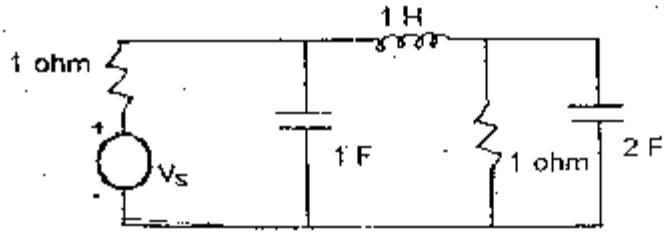


3. a) The open loop TF of a unity feedback control system is given as: [8]

$$G(s) = \frac{K}{(s-2)(s+4)(s^2+6s+25)}$$

Determine the range of gain K for the system to be stable. Also determine the value of K which will cause the sustained oscillation and corresponding oscillation frequency.

b) Write state equation for the system as below shown. Consider voltage across 2F capacitor as output. [8]



4. a) Sketch approximate polar plot for a unity feedback system with feed forward transfer function $G(s) = \frac{10}{s(s+1)^2}$ and obtain gain margin. [8]

b) Draw bode plot of a system having open loop transfer function, $G(s) = \frac{4(s+4)}{(s+2)(s^2+2s+4)}$. Also analyze the stability. [8]

5. Design a lead compensator for a system having open loop transfer function as $\frac{4}{s(s+2)}$, such that the designed system should have %Mp ≤ 16.3% and settling time (t_s) ≤ 2 sec. [16]

***

22 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2067 Ashadh

Exam.		Regular/Back	
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Control System

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Semi-log and normal graph paper will be provided.***
- ✓ *Assume suitable data if necessary.*

1. a) Find the transfer function $X_1(S)/F(S)$ of the mechanical system shown in figure 1. Also find the force-voltage analogy of the same system. [8]

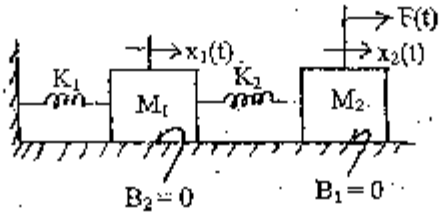
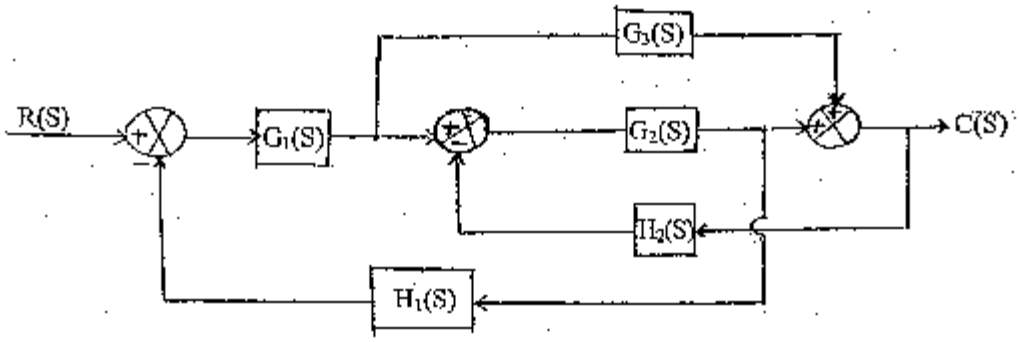


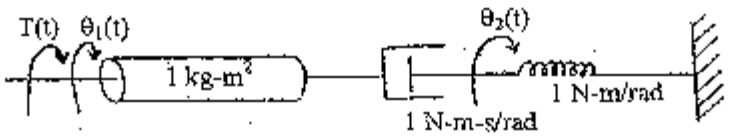
Figure 1

b) Represent the mechanical system of figure 1 with state equation and output equation, if output is $x_2(t)$ in the figure. [8]

2. a) Draw signal flow graph for a system whose block diagram is shown in figure below and determine C(S)/R(S). [8]



b) A step torque T(t) is applied in a system shown in figure below. Find the percent overshoot, settling time and peak time for output $\theta_2(t)$. [8]



3. a) The open loop transfer function of a unify feedback system is given by $G(S) = \frac{K}{S(1+ST)}$; where 'K' is the gain constant and 'T' is time constants. With the gain multiplied by a factor K_1 the maximum overshoot of the system is increased from 25% to 50%. Determine K_1. [8]

b) The open loop transfer function of a unify feedback system is given by $G(S) = \frac{5}{S(S+2)(S^2+2S+8)}$. Find the static error coefficients and steady state error of the system when subjected to an input given by $r(t) = 2 + 5t + 2t^2$. [8]

4. a) For a unity feedback system that has the forward transfer function $G(S) = \frac{K(S+2)}{(S^2-4S+13)}$. [8]

i) Sketch the root locus.
ii) Find the imaginary axis crossing.
iii) Find the gain K, at the jw axis crossing.
iv) Find the break-in point.

b) Examine the closed-loop stability of a system applying nyquist criterion whose open-loop transfer function is given by $G(S)H(S) = \frac{50}{(S+1)(S+2)}$. [8]

5. The open loop transfer function of a unify feedback is $G(S) = \frac{K}{S(1+0.2S)}$. It is required that $K_v \geq 20\ sec^{-1}$ and phase margin (ϕ_{PM}) = 44°. Design a lead compensating network to satisfy the required specifications. [16]

***

22 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2066 Bhadra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Control System

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any **Five** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) What is open loop and close loop control systems? Draw the block diagram of closed loop control system and explain the role of each block. [8]

   b) For the mechanical system shown in fig.1(b), draw body diagram, write complete differential equations and identity the transfer function $X_1(s)/F_1(s)$. [8]

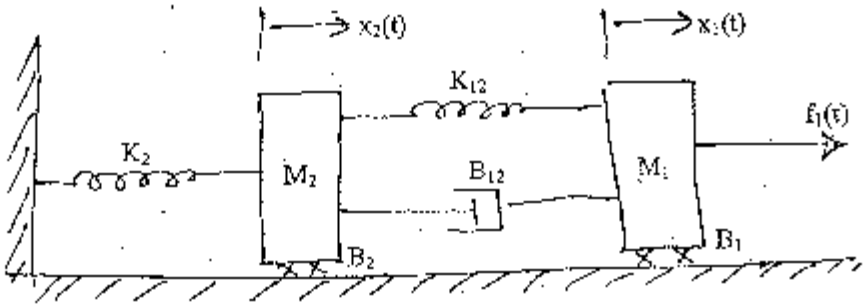


Fig.1(b)

2. a) Reduce the block diagram of fig.2(a) and find the overall transfer function C(s)/R(s). [8]

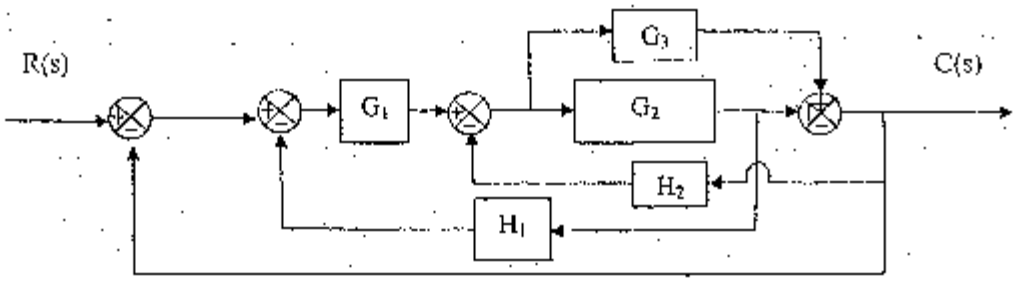


Fig.2(a)

   b) For the system shown in Fig.2(b), find J and D to yield 20% overshoot and a settling time of 2 seconds for a step input of torque T(t). In the figure θ(t) is the output. [8]

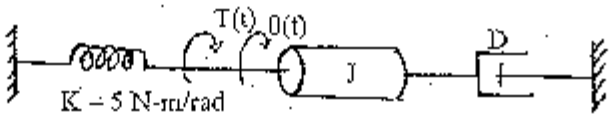


Fig.2(b)

3. a) Using R-H criteria, tell how many roots of polynomial is in right half plane, in left half plane and on jw-axis. $P(S) = S^5 + 3S^4 + 5S^3 + 4S^2 + S + 3$. [8]

b) Sketch the root locus of a unity feedback control system with open loop transfer function $G(s) = \frac{k(s+4)}{s(s^2+2s+2)}$ and find the range of k for which the system will be stable. [8]

4. a) Use Nyquist stability criteria to evaluate the stability of the system with open loop transfer function, $G(s) = \frac{10}{s(s^2+2s+4)}$. Identify phase cross-over frequency and gain margin from the Nyquist plot. [8]

b) The open loop transfer function of a unity negative feedback system is given by $G(s) = \frac{20}{s(0.5s+1)(s+2)}$. Calculate the static error constants for this system. Also calculate the steady state error due to input $r(t) = 10 + 5t$. [8]

5. a) Mention P, I and D controllers. Also explain the role of PI and PP controllers on transient and steady state performance specification. [8]

b) Evaluate the percentage overshoot and peak time for the unity feedback system with open loop transfer function, $G(s) = \frac{5}{s(s+4)}$. [8]

6. The open-loop transfer function of a unity feedback control system is given by $G(S) = \frac{K}{S(1+0.2S)}$. Design a lead compensator such that velocity error constant, $K_V = 10$ and phase margin = 50°. [16]

***

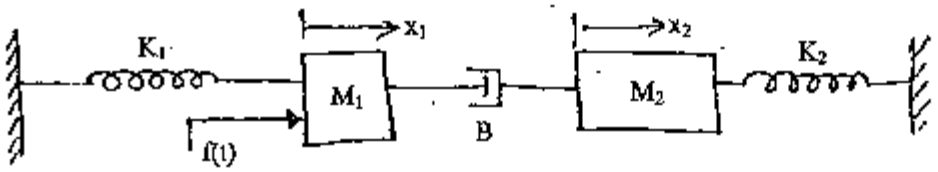
22 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2066 Jestha

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Control System

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Semilog graph paper will be provided.***
- ✓ *Assume suitable data if necessary.*

1. a) Draw free body diagram, write complete differential equations and find the transfer function $X_1(S)/F(S)$ for the dynamic system shown below. [8]

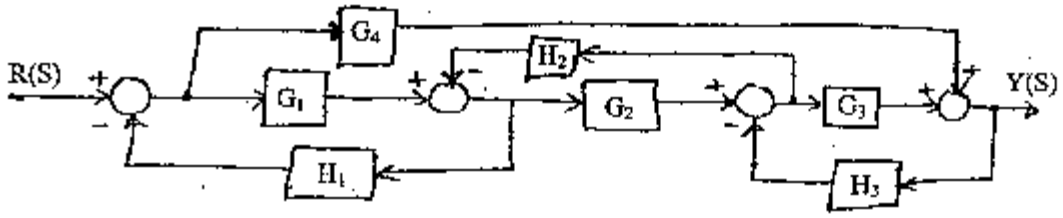


b) The open loop transfer function of a unity feedback system is given by: [8]

$$G(S) = \frac{K}{S(S+1)(S^2+2S+2)}$$

Calculate the static error constants for this system and find the range of K if static error is less than 0.5 for input $r(t) = 10 + 50t$. [8]

2. a) Evaluate the transfer function Y(S)/R(S) for the system represented by following block diagram. [6]



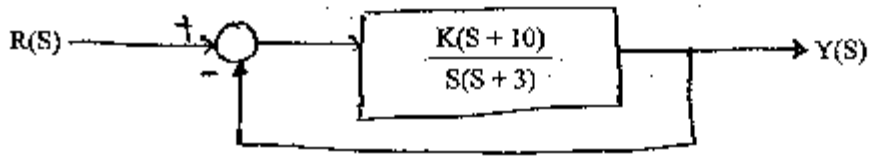
b) Discuss the advantages and limitations of state-space analysis of control systems. Find the transfer function for the system represented by following state-space model. [10]

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix} = \begin{bmatrix}-4 & -1\\ 10 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix} + \begin{bmatrix}1\\ 0\end{bmatrix}[u]$$

$$[y] = [1 \quad 0]\begin{bmatrix}x_1\\ x_2\end{bmatrix}$$

Also evaluate the stability of this system.

3. a) For a process control system shown below, find the range of K for which the roots of characteristics equation are more –ve than S = –2. [6]



b) Draw root locus for a unity feedback system with open loop transfer function $G(S) = \frac{K(S+1)}{S^2(S+3.6)}$. Also determine the range of K for (i) overdamped response and (ii) unstable system. [10]

4. a) Draw the assymptotic Bode magnitude plot of the unity feedback system whose open loop transfer function is given by: [6]

$$G(S) = \frac{125}{S(S^2+10S+25)}$$

b) Use Nyquist stability criterion to find the range of K for which the unity feedback system represented by open loop transfer function $G(S) = \frac{K}{S(S+1)(S+2)}$ is stable. [10]

5. a) Discuss in brief the use of PID controllers in control system. [6]

b) The open loop transfer function of a unity feedback system is given by [10]

$$G(S) = \frac{K}{S^2(0.2S+1)}.$$

Design a lead compensator to meet the following specifications.

Acceleration error constant = 10
Phase margin = 35°

***

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2065 Shrawan

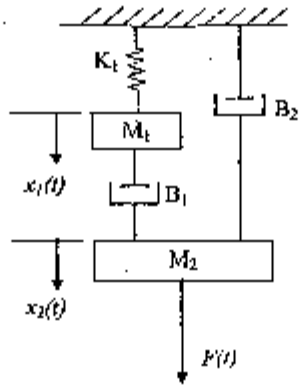
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Control System

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Semi-log graph paper will be provided.***
- ✓ *Assume suitable data if necessary.*

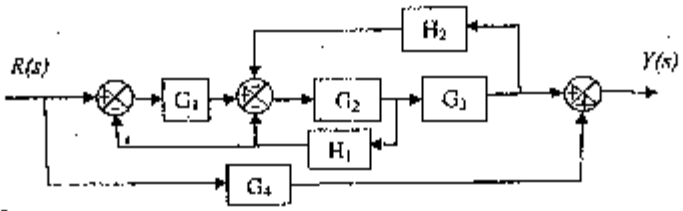
1. a) Draw the close loop control system configurations showing major components. Discuss the advantage and disadvantage of closed loop systems. [8]

b) Derive the transfer function $X_2(s)/F(s)$ for the system shown below. [8]



2. a) Find the unit step response of a unity feedback system whose open loop transfer function is given by $G(s)H(s) = \frac{4}{s(s+2)}$. [8]

b) Derive the overall transfer function Y(s)/R(s) for the system shown below using block reduction technique. [8]



3. a) The open loop transfer function of a unity feedback system is given by: [6]

$$G(s)H(s) = \frac{4}{s(s^2+4s+4)}$$

Find the static error constants and calculate error due to input $r(t) = 4t + 1$.

b) Draw the root locus for the system with open loop transfer function: [10]

$$G(s)H(s) = \frac{k}{s(s^2+10s+24)}$$

From the root locus, find the gain (k) and corresponding natural frequency of oscillation when the damping ration is 0.7.

4. a) Draw the Nyquist plot for the following open loop transfer function. [8]

$$G(s) = \frac{(s+2)}{s(s+1)(s+3)}$$

b) Discuss the advantages of state space representation. Find the state equation and output equation of state space form for the system represented by transfer function. [8]

$$G(s) = \frac{2s^2+3s+1}{s^3+5s^2+6s+7}$$

5. Design a lead compensator for a system with open loop transfer function $G(s) = \frac{k}{s^2(s+5)}$ for the specifications of phase margin = 30° and acceleration error constant, $K_a = 5sec^{-2}$. Also draw the bode magnitude and phase plots after compensation. [16]

***

27 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, B. Agri.	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Communication English *(SH601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt All questions.*
- ✓ *The figures in the margin indicate Full Marks.*
- ✓ *Assume suitable data if necessary.*

1. Edit the following: [5]
Two pastors are standing by the side of a road holding up a sign that reads. The end is near turn around now before its too late! A passing driver yells, "you guys are nuts!" and speed past them. From around the curve, they hear screeching tyres- then a big splash. One of the pastors says to the other, do you think we should just put up a sign that says Bridge broken instead?

2. Study the following paragraph carefully and interpret it in your own words: [5]
The prevention of free inquiry is unavoidable so long as the purpose of education is to produce belief rather than thought to compel the young to hold positive opinions on doubtful matters rather than to let them see the doubtfulness and be encouraged to independance of mind. Education ought to foster the wish for truth, not the conviction that some particular creed is the truth.

3. Study the following text carefully, prepare notes and convert it into summary: [5+5]

One day in 2003, while on her morning walk in the park, Valavolkar felt a shape pain in her left shoulder. The pain soon subsided and she decided to go about her chores.

But a few hours later, the waves of pain returned when she was out walking again, this time to see the neighbourhood dentist about a cavity. It was much than in the worse morning. Overwhelmed with nausea, dizziness and shoulder pain that grew more intense with every step she took, she felt too weak to move. Anyhow, her husband and son being away at work, she assumed it was spondy litis and got in touch with a family friend, an orthopedic doctor, who insisted she see a heart specialist immediately.

At workhardt hospital soon afterwards, it became clear to the medics that she was having a myocardial infaretion, a heart attack caused by the blockages- in Valavalkar's case of three blood vessels to the heart. One of them, a key artery, had a 95 percent blockage. An angioplasty was performed and a stent inserted to open up the blockage. Her medical care had been so swift, however, that there was no serious damage to the heart muscle.

Since then she hadn't been without trouble, but a cardiac rehab programe she entered in 2006 has helped her lead a normal life. "I feel fine now," Valvakar says, looking back. "Periodic check ups are essential and fortunately for me, these have revealed no problems. I am very active now. I even counsel other heart patients to help them stay positive."

"Women have different risk factors for cardiac disease than men, but there is such little awareness, " says Dr.Vanita Arora cardiae electrophysiologist and associate director at the Max Health Care Superspeciality Hospital in New Delhi.

4. Answer any two of the following questions: [5+5]
   a) Point out weaknesses of steam boilers and suggest any other better option of source of energy in context of Nepal. Tell why you think that could be the better option. (Steam Boilers)
   b) In recent years we Nepalese have seen colorful advertisements in newspapers about multi-storeyed apartments from different housing companies. In relation to this, talk about the suitability of the text "Piles for Foundations."
   c) Describe the various features that contribute to wisdom with reference to the text "Knowledge and Wisdom".

5. Fill up the following blank spaces selecting the correct words from the brackets: [0.5×10]

   a. He, along with his teachers, ...playing. (is, are)

   b. The principal and accountant.....on leave. (is, are)

   c. It .....a long time since he telephoned me. (is, has been)

   d. It's high time he .....the job. (got, has got)

   e. Had it not been a hot day, we .....a lot. (had worked, would have worked)

   f. Should that happen, I .....the job. (should quit, will quit)

   g. I'll stand .....you whatever happens. (for, by)

   h. The project is running .....financial difficulties. (with, into)

   i. The passive voice of "I remember him teaching me algebra" is ..... (I remember being taught algebra/I remember to being taught algebra by him.)

   j. The passive voice of "I saw him crossing the road" is ..... (He was seen crossing the road by me/He was seen to be crossing the road.)

6. Convert the following APA style into MLA and MLA into APA: [4]

   a) Santos, Richard. "Tax break?" The New Republic. 12 July. 1998: 24-40.
   b) Scotto, P.Censorship, Reading and Interpretation. (2011) Studies in American Obfuscation 61-70.
   c) Feller, Jane. "Critical People Cause Office Fireworks" (2010, June 4). The Providence Journal, P.A1.
   d) Prepare in text citation for:
      Wang, P. (1999, July) Fund Watch. Money, PP.49-54.

7. Assume that you have been appointed secretary of a committee comprising management, staff and workers representatives to advise the company to produce a handbook containing information about conditions of service, rules and regulations of fringe benefits and other related matters. Write a notice to call a meeting to discuss above matters. [5]

8. Suppose you are the chief consultant of Road Expansion Project being launched in the capital city Kathmandu. Write the second quarterly progress report in memo style. [6]

9. Write a brief research article on advancements made in the last decade in your field of engineering. [10]

10. Most communities do not have a place for scientists and citizens to meet to discuss important issues. You have a way to meet the needs of citizens who lack access to scientific expertise by bringing together scientists and non scientists to identify, discuss and resolve issues of public concern. Therefore as a matchmaker for groups and resources write a proposal. Include an introduction stating the problem and its significance. Discuss the proposed outcome and include a time table. [10]

11. Imagine that Government of Nepal has formed a committee under your chairmanship for the purpose of studying the effect of noise pollution in the industrialized towns in Nepal. Prepare only the title page, abstract, table of contents and recommendations sections of the report that you are going to submit shortly. [10]

***

24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

Exam.	Old Back (2065 & Earlier Batch)		
Level	BE	Full Marks	40
Programme	BEL, BEX, BCT	Pass Marks	16
Year / Part	III / I	Time	1½ hrs.

Subject: - Communication II (English) ***(EG604SH)***

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Transform the following sentences as indicated in the brackets: [4]
   a) Sunita is different from her elder sister (AmE)
   b) Sit down. (Very polite English)
   c) People believe that the leaders will sign the agreement. (Impersonal English)
   d) The meeting will commence soon. (Informal English)
2. Answer any two of the following questions: [8]
   a) How is 'beauty' losing its charm day by day? (Beauty)
   b) Why should a technician be wise? (Knowledge and Wisdom)
   c) "Customs have a great impact on our life". Justify this with reference to the text 'customs'.(Customs)
3. Write a description of the processes involved in getting a document printed out in a lap-top. [4]
4. Prepare a fifteen-minutes' technical talk on the problem of noise pollution in your own town. [8]
5. Imagine that you are the secretary of a social organization and the fifth meeting of the same organization has been held recently. Write minutes of the recent meeting. [6]
6. Suppose you have conducted a research on the effect of recent earthquake in Nepal. Write abstract, methodology, conclusions and recommendations of your report. [10]

***

27 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEI., BEX, BCT, B.Agri.	Pass Marks	32
Year / Part	III / I	Time	3 hrs

Subject: - Communication English *(SH601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. Edit the text given below: [5]

Incessant practices went up, and the day came when we had to leave to America to study at an advance institute. Always my father was there to guide me. Today, I'm quite a successful pianist, but my father does not stop saying practice more. God smiles and the perfection just glitters when practise touches the top. I now know much than ever that ceaseless effort is the key of succes.

2. Read the following text carefully and interpret it so as to make the meaning clear: [5]

The reason why this book has been specially prepared to make it enjoyable reading for people to whom English is a second or foreign language is that an English writer never thinks of avoiding unusual words, so that the learner, trying to read the book in its original form, has to turn frequently to the dictionary and so loses much of the pleasure that the book ought to give.

3. Study the following text carefully. Prepare its note and convert it into summary. [5+5]

We are well acquainted with the fact that men and women are different in terms of appearance. What many people do not realize is that they are also different in communication technique. Generally speaking, men and women fall into two categories when dealing with communication techniques. When men talk, it is for giving information. This informative speaking is " report talk". " Report-talk" is defined as " public speaking". Women on the other hand, use " small talk" to communicate." Small talk" is a conversation which is usually considered to be short and meaningless. This communication technique of women is " rapport-talk". " Rapport-talk" in other words is " private speaking".

Without being aware that we are supposed to be different, men and women are at odds with each other. The reason why we become angry or frustrated with the opposite sex is because we have forgotten this fact. They want their opposites to " want what they want " and " feel what they feel". This very attitude makes a path for disappointment and prevents them to take the necessary time to communicate loving about their differences.

Men mistakenly expect women to think, communicate and react the way men do; women mistakenly expect men to feel, communicate and respond the way women do. That is the time when unnecessary friction and conflict occur.

Individuals should be aware that you could use different styles of conversation to fit the information that you are trying to present. You should also never assume that the opposite sex is going to understand what you are trying to say. You should never criticize others who communicate differently than you. Men and women are ruthless about criticizing the opposite sex.

It is never too late to increase the love in your life. You only need to learn a new way. Whether you attend a therapy or not, if you want to have more fulfilling relationship with the opposite sex, it is essential to learn new and healthy ways of relating and communicating.

01/14

4. Answer any two of the following questions: [5x2]
   a. " Even the best technicians should also be good citizens." Do you agree? If yes, why? (Knowledge and Wisdom)
   b. How do modern boilers function? (Steam Boilers)
   c. What is the central theme of " Civil Peace "? (Civil Peace)

5. Choose the correct words from the brackets and fill in the blanks: [0.5×10]
   a) Look ..... your health (to, up)
   b) I feel the room .....(move, to move)
   c) If I ..... you, I would not do it. (be, were)
   d) I heard him ..... . Narayan Gopal's song (singing, sing)
   e) She cannot part ..... her jewels (from, with)
   f) He died ..... T.B last year. (with, of)
   g) She walked as if she ..... a lot. (drunk, had drunk)
   h) He as well as his comrades ..... out (is, are)
   i) The teacher said that ..... are mortal (we, they)
   j) You alone can relieve me ..... this anxiety (from, of)

6. Change the following bibliographic references as indicated in the brackets: [4]
   a. Jones, Leo. (1998). Cambridge Advanced English. CUP: New Delhi. (into MLA)
   b. Sasikumar, J. and Gunshekhar, P. Spectrum. Orient Longman: New Delhi, 1977. (into APA)
   c. Leech, G. and Svartvik, J. A Communicative Grammar of English. ELBS: England, 1975. (into APA)
   d. Quirk, Randolph and Greenbaum, Sidney. (1973). A University Grammar of English. ELBS: England. (into MLA)

7. Write minutes of a recently conducted meeting regarding save the Bagmati River. [5]

8. Suppose you have recently visited a publishing firm. Write a trip report about your observations. [6]

9. Write a proposal on the establishment of "Drinking water scheme of your local VCD/town) including only Abstract, Introduction and Methodology. [10]

10. Write a brief research article on the importance of forest conservation in Nepal. [10]

11. Assume that you are asked to prepare a final report of a power house construction project. Write only the following parts: Title page, Abstract and Recommendation. [10]

***

21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2069 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, B.Agri.	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: – Communication English *(SH601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. After taking notes, write a summary of the following passage in about one third of the words of the original. [5+5]

From the date of the introduction of the stream locomotive about 130 years ago, there was a continuing increases in the size and weight of trains. This necessitated engines of greater and greater power. In order to achieve this increase in power, much higher steam pressures were required. The modern steam locomotive is capable of generating steam pressures often in excess of 300 lb/in^2, against the 50lb/in^2 pressure of Stevenson's 'Rocket'. Normally the demand for increased steam capacity is met by increasing the size of the boiler. However the boiler of a steam locomotive is strictly limited in size by the dimension and load capacity of the railway track which it works on. It is therefore necessary to have a very large heating surface within the boiler.

There are two fire-boxes inside the boiler, an inner one and an outer one, which extend a long way forward. The inner fire-box is linked by tubes to the fire-plate at the front of the boiler. Practically the whole of the heating surface, which includes these fire-tubes, is surrounded by water. A high rate of evaporation in the boiler is essential, in order to generate the large quantities of steam which are required. For this purpose a powerful draught of air is blown over the fire. The steam which is evolved is passed through a super-heater, which raises its temperature and makes it as dry as possible. Rapid evaporation at the heating surface tends to make the steam wet. The use of wet steam necessitates excessively high pressures in the cylinder. Super-heating the steam enables to requisite power to obtained with considerably lower pressures.

The superheated steam is passed to the steam-chest which is attached to the cylinder. From the steam-chest it is introduced into the cylinder at the appropriate moments through ports. These ports are opened and closed by slide valves, which are actuated by the rotation of the locomotive crankshaft. The steam is admitted under pressure to one side of the cylinder, and drives the piston forwards. The inlet port is then closed, and a second charge of steam is admitted at the other side of the cylinder to drive the piston in the reverse direction. The exhaust steam from the first charge is driven out into the atmosphere through a blast pipe. This is done in order to increase the draught over the fire. The reciprocating action of the piston is changed into a rotational movement of the wheels by a connecting rod and crank.

2. Read the following text carefully and interpret it so as to make the meaning clear: [5]

A British survey found that 44 percent of the firms, which started to use robots, met with initial failure and 22 percent abandoned them altogether, mainly because of inadequate technological knowhow and skills at all plant levels.

3. Answer any two of the following questions briefly. [5×2]

   i) Describe the contribution of Einstein to the modern scientific world? (What Einstein Did?)

   ii) Why do the ordinary non-technical people find the words 'oxygen' and 'intelligence' confusing? (Straight and crooked thinking)

   iii) Is English language necessary for an engineering student in Nepal? Justify it.

4. Edit the following passage which contains a good many errors. [5]

Certain jobs mostly simple or hazardos one are irretrievably loses too roboties. Thus spot welders press operators, spray painters cleaners, machine loaders grinding and polishing machine operators is endangered species.

5. Choose the correct words from the brackets: [0.5×10]

a) The minister, along with his relatives ..... gone to Japan. (has/have)

b) Neither of us ..... going to attend the programme. (is/are)

c) It is quite warm ..... december. (for, form)

d) You alone can relieve me ..... this anxiety. (from, of)

e) We have nothing ..... about. (to have worried, to be worried)

f) I remember ..... to the salarjung Museum by my father. (to be taken, being taken)

g) Unless you ..... you will be punished. (lonet pay, pay)

h) If i ..... you, i would not do it. (be, were)

i) She was made ..... cloths. (wash, to wash)

j) I heard him ..... Narayan Gopal's song. (singing, sing)

6. Change the following bibliographic references from APA style into MlA: [4]

a) Ellis, R.(1996). How culturally appropriate is the communicative approach? ETT Journal, 50 (3)

b) Goodson, I. (2001). The principled professional. Prospects, xxx (2), 181-188.

c) Hughes, A. (1989). Testing for language teachers. Cambridge: Cambridge University press.

d) Nunan, D. (1989). Understanding language classroom. U.K: Prentice Hall.

7. Suppose you are the Manager of a project related to micro hydro-power production plant launched in one of the remote villages in Nepal and your project is going to terminate soon as the work has already been accomplished. Write abstract, introduction, methodology and findings of your report giving just the outline of the remaining parts. [10]

8. Suppose you are the secretary of a social organization in your town and the seventh meeting of the Executive body has been conducted recently. Write the minutes inventing necessary agenda and details. [5]

9. Assume that you are requested the write a proposal on establishing engineering collage in Kathmandu. Write the following parts with the outline of your proposal: Abstract, statement of problem and procedure. [10]

10. Write a brief research article on importance of computers for the development of Nepal. [10]

11. Imagine that a project related to the construction of a lab of your engineering field is going on in a local government office. Write the first monthly progress report on the same project in a memo formate. [6]

***

21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2068 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, B. Agri.	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Communication English *(SH 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. After taking notes, write a summary of the following passage. [5+5]

Since it is essential to secure rapid and complete combustion in the cylinder of an internal combustion engine, the fuel and air mixture must be thoroughly mixed; and further, it must be in the correct proportions for all running conditions of the engine. This is accomplished by means of a device called a carburettor. In this carburettor, a stream of air blown over a jet mixes intimately with a spray of petrol drawn out of it. The jet is inserted into a choke or venturi in the intake manifold, and is supplied with petrol at atmospheric pressure.

During the suction stroke of the piston, the pressure in the intake manifold is below atmospheric, and air is induced through the intake and over the jet. ***As there is a further drop*** in pressure at the venturi, the pressure difference produced is large enough to draw petrol up out of the jet and atomise it. The level of the petrol in the jet is kept constant by the float and needle valve in the float chamber, which acts as a reservoir for the fuel. Above the venturi there is a throttle valve operated by the accelerator pedal, which controls the amount of mixture admitted to the cylinder.

However, this simple form of single-jet carburettor will not give correct mixture strength for all engine speeds. The chief difficulty encountered is that, at high running speeds, the amount of petrol taken up at the jet will increase faster than the increase in air-flow. Therefore a carburettor set to give correct mixtures at low speed will give a progressively richer mixture as the speed increases. To compensate for this, a second jet is provided, fed from a well open to the atmosphere and supplied with petrol from the float chamber. ***Owing to the fact that this compensating jet is larger*** than the main jet, it can supply petrol at a quicker rate than the main jet until the well is emptied. As the speed is increased, more and more of the petrol required is drawn from the main jet. The compensator jet can now supply only as much petrol as can pass through the small compensator orifice in the float chamber.

Another problem to be solved is that of starting. In order to obtain the rich mixture required for starting, the throttle must be almost closed, ***As the air velocity is then very low*** in the venturi, insufficient petrol is drawn out of the jet. This difficulty is overcome by the provision of an idler jet in the wall of the intake manifold near the throttle valve. This jet will only function when the throttle is nearly closed. When it is opened for faster running, the suction round the edge of the throttle decreases, and the idler automatically ceases to act.

2. Answer the following questions briefly: (any three) [3×5]

   a) What is the importance of reading books in our life? [Of studies]

   b) Write a summary of the text " The mother of a Traitor". [The mother of a Traitor]

   c) Describe the importance of science with reference to the next 'The scientific Attitude'. [The scientific Attitude]

   d) What are the factors responsible for failure in successful communication.

3. Choose the correct words from the brackets: [0.5×10]

   a) Either you or I ..... supposed to do it. (are, am)
   b) The government .....decided to increase the salary of their civil servants. (have, has)
   c) The teacher said that we .....mortal. (are, were)
   d) She says that she .....more food. (wants, wanted)
   e) This notice.....altered. (has been, have been)
   f) A lot of the work .....by the students. (is being done, are being done)
   g) If I had enough money, I.....this car. (would have bought, would buy)
   h) Unless you.....hard, you can't pass the exam. (work, don't work)
   i) He died.....T.B last year. (with. of)
   j) She always takes.....notes in her class. (up, down)

4. Transform the following references from APA style to MLA style: [4]

   a) Perkin, H.C. (1975). Air Pollution. McGraw Hill: NewDelhi.
   b) Hall, Dauglas. (1989). Digital Circuits and Systems. Macmillan: Newyork.
   c) Morgan, J.H. (1960). Cathodic Protection. Macmillan: Newyork.
   d) Slabough, W.H. (1954). Mechanism of Filiform Corrosion. Oxford University Press: USA.

5. Write a short research article on the effect of noise pollution in urban areas in Nepal in about 300 words. [10]

6. Edit the following passage which contains a good many errors. [5]

   Aristotle the tutor of Alexander the Great was born in Stagira in Macedonia in 300 BC. Together with Plato, he is regarded as one of greatest philosophers the world knew. Aristotle was a true academic, concerned for Physics, Astronomy, Rhetoric, Literature, Political Science and History. His teachings has laid the foundation for modern scientific thought.

7. Suppose you are the secretary of a newly formed committee of Public Health Care Society. Write the minutes of the first meeting held recently inverting the agenda. [5]

8. A large number of deaths are caused by earthquakes. To minimize the loss of lives you want to do a study. Write a brief proposal to an organization sticking on objectives, procedure and rationale. [8]

9. The Minister for Road and Transport is concerned about the rapid increase in the number of road accidents on the highways. As a newly formed commission chairman, write a brief formal report investigating the causes and suggesting measures to control the road accident. [10]

10. Write a monthly progress report to be submitted to the Cheif Engineer, Department of Roads on the construction of a Bagmati Bridge near Thapathali. [8]

***

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2066 Bhadra

Exam.	I	Regular / Back	
Level	BE	Full Marks	40
Programme	BEL, BEX, BCT	Pass Marks	16
Year / Part	III / I	Time	1½ hrs.

Subject: - Communication II (English)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. Change the following sentences as indicated in brackets. [4]
   a) One needs to express oneself more clearly. (AME)
   b) The government is going on with its struggle against inflation. (Formal)
   c) MM well we could have another holiday. (Written)
   d) When will you be meeting him? (Familiar)
2. Answer any two of the following questions: [8]
   a) How did Monna Marinna prove herself to be a citizen and a mother? (The Mother of a Traitor)
   b) Why might it be important to understand aspects of other cultures' standard? (Customs)
   c) What are the advantages of wisdom over knowledge? (Knowledge and Wisdom)
3. Describe the processes involved in distillation of water in about 150 words. [4]
4. Write a note for a thirty-minute technical talk on "Glaciers; one of the water resources of Nepal". [8]
5. Assume the three agendas, and write the minutes of the meeting relating to construction of a water supply scheme in your V.D.C. [6]
6. Write a report on The Damages Caused by the Kosi River including only the title page, preface and conclusion. [10]

***

25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2066 Jestha

Exam.	Back		
Level	BE	Full Marks	40
Programme	BEL, BEX, BCT	Pass Marks	16
Year / Part	III / I	Time	1½ hrs.

Subject: - Communication II (English)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Transform the following sentences as instructed in brackets: [4]
   a) What John bought last week was an old car. (spoken)
   b) May I help you? (informal)
   c) I beg your pardon! (BrE)
   d) No, I don't want any more. (polite)
2. Answer any two of the following questions: [8]
   a) What change in attitude do you think the writer wants to bring about in her readers? (Beauty)
   b) Summarize the argument of the text 'Knowledge and Wisdom'.
   c) Assume yourself as the mother and express your feelings towards your son. (The Mother of a Traitor)
3. How do you operate a telephone? Write a simple process description. [4]
4. Assume that you have been appointed as a Secretary of a committee formed to advise a Company to produce a handbook containing information about the conditions of services, rules and regulation, and benefits. The committee held its first meeting. Draft a three-point agenda and the minutes of the meeting. [6]
5. Write a complete manuscript of a ten-minute talk on 'importance of reference materials and their importance'. [8]
6. You are writing a report to the director of the Central Institute of Environmental Studies, as the regional representative, Kathmandu on the problem of water pollution in your region. Include the following parts only. [10]

   Title Page, Abstract, Content Page and Recommendations

***

25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2065 Shrawan

Exam.	Regular/Back		
Level	BE	Full Marks	40
Programme	BEL, BEX, BCT	Pass Marks	16
Year / Part	III / I	Time	1½ hrs.

Subject: - Communication II (English)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Change the following sentences as indicated in brackets: [4]
   a) Candidates are required to give their answers in their own words. (Spoken)
   b) How do you do? (Informal)
   c) You simply must read this book. (AmE)
   d) Shut the door. (Polite)

2. Answer any two of the following questions: [8]
   a) Summarize the argument of the text 'Use and Misuse of Science'.
   b) If beauty is a source of power, why does the writer object to women's striving to attain it? (Beauty)
   c) What was the conflict in the mother's mind and how did she resolve it? (The Mother of a Traitor)

3. Prepare a note for a talk on 'Importance of PowerPoint presentation in technical communication' lasting for 30 minutes. [8]

4. Assume that your have recently taken over as the secretary of a public limited company. You come to know that the growth of the organization has been hampered because of frequent strikes by labours. Inventing necessary details, write a notice along with a three-point agenda to call an urgent meeting. [6]

5. Write a simple description of a 'paper clip' followed by picture illustration. [4]

6. Prepare a cover page, preface and conclusion of a report on 'Development of Information Technology in Nepal'. [10]

***

25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2063 Baishakh

Exam.	Regular / Back		
Level	BE	Full Marks	40
Programme	BEL, BEX, BCT	Pass Marks	16
Year / Part	III / I	Time	1½ hrs.

Subject: - Communication II (English)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Change the following sentences as indicated in brackets. [4]
   a) Their house is different that ours. (BRE)
   b) One cannot succeed unless one tries hard. (AME)
   c) It is necessary that every member should inform himself of these rules (AME)
   d) The congress insisted that the present law continue to operate. (BRE)
2. Answer any two of the following questions: [8]
   a) Why might it be important to understand aspects of other cultures' standard?
   b) Show advantages of wisdom over knowledge.
   c) 'Is it she?' 'it is she!' what does this exchange tell us about what the people thought of her? What did they do when they saw her? Why?
3. Write a brief description of a mechanical tool that you frequently use in your field of engineering. [4]
4. Prepare a twenty minute technical talk on "Causes and effects of vehicle smoke emission at high traffic load hours". [8]
5. Assume that a body is formed to improve teaching learning situation in your campus. As the secretary of that body write a notice along with three agendas to call its first meeting. [6]
6. You are asked to prepare a report on 'Price hike in Nepal'. Write only the following parts of that report: [10]
   a) Preface
   b) Acknowledgements
   c) Conclusion

***

25/2-2 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2062 Baishakh

Exam.	Regular/Back		
Level	B.E.	Full Marks	40
Programme	BEL, BEX, BCT	Pass Marks	16
Year / Part	III / I	Time	1½ hrs.

Subject: - English

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Change the following sentences as indicated in brackets. [4]
   a) The meeting will commence at 4 PM. (informal)
   b) Would you please accept my invitation? (familiar)
   c) My book is different than yours. (BrE)
   d) The government is planning to enforce the rules strictly. (impersonal)
2. Answer any two of the following: [8]
   a) Describe the effects of customs on the guests of a trader's wife and a youth from China.
   b) Who is a better person according to Russel – a knowledgeable man or a wise man?
   c) What was the conflict in the mother's mind and how did she resolve it?
3. Write a simple description of your campus library in about 150 words. [4]
4. Prepare thirty minute's technical talk causes and effects of air pollution in Kathmandu Valley. [8]
5. Suppose you are the coordinator of a seminar on 'Scope of Electronics Engineering in Nepal' to be held shortly in Kathmandu. Draft a letter for calling the meeting. [6]
6. You have got a contract to construct a new boy's hostel in the campus premises. Prepare the title page and write abstract and conclusion of the report that you have to send to the concerned agency. [10]

***

35/2-3 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2061 Baishakh

Exam.	Regular / Back		
Level	B.E.	Full Marks	40
Programme	BEL, BEX, BCT	Pass Marks	16
Year / Part	III / I	Time	1½ hrs.

Subject: - English

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt All questions.*
- ✓ *The figures in the margin indicate Full Marks.*
- ✓ *Assume suitable data if necessary.*

1. Transform the following sentences as instructed in the brackets. [4]
   a) After his dad's death, Peter had to change his job. (into Formal)
   b) The congress insisted that the present law should be continued to operate. (into AmE)
   c) What is your name? (into Polite)
   d) Non-stop sound of the blower made Pete's old woman hit the roof. (into Common Core)

2. Answer in brief any two of the followings. [2×4]
   a) Explain the meaning, "if ethical principles deny our right to do evil that good may come, are we justified in doing good when the foreseeable consequence is evil?" (Use and Misuse of Science)
   b) Do you support the decision taken by Monna Marianna? Support your opinion with references from the text. (The Mother of a Traitor)
   c) What is Christian concept of "beauty"? Compare it with that of Susan Sontag's.

3. Prepare a 'technical talk' on the computer and internet system in about 200 words. [8]

4. Keep a short minute of a FSU meeting based on the following agenda. [6]
   a) Extra-activities programme
   b) Launching cleaning-up campaign to keep the campus environment clean
   c) SAARC institutional tour
   d) Publication of a journal
   e) Shifting of union office from Block 'A' to Block 'B'

5. Imagine you are a chairperson of a five-membered commission formed for investigation the causes of the national black out for 2 days in Nepal. Prepare a short report on the findings on the investigation. Include only the following sections: [10]
   cover, acknowledgements, contents, conclusion

6. Describe the location of your campus. [4]

***

25/9-24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2060 Poush

Exam.	Back		
Level	B.E.	Full Marks	40
Programme	BEL, BEX, BCT	Pass Marks	16
Year / Part	III / I	Time	1½ hrs.

Subject: - Communication II (English)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Give the variety label of the following sentences with reasons. [4]
   a) He announced – the plane is landing soon.
   b) Would you please help me to solve this question?
   c) He asked me what is your name please.
   d) It is better to reign in hell than to serve in heaven.
2. Prepare a cover page, summary and conclusion of a report on role of Technical Education in Nepal to be submitted to the Ministry of Education. [10]
3. Answer any two of the following questions: [2×4]
   a) What was the conflict in the mother is mind and how did she resolve it? (The mother of a Traitor)
   b) How are women made feel inferior? (Beauty)
   c) Do you like to prevent misuse of science? If yes, how? (The Use and Misuse of Science)
4. On behalf of the secretary of Engineering Association, write a notice for a meeting along with the agenda to be sent to the members of this association. [6]
5. Write a short introducing remarks of a technical talk. [8]
6. Describe the morning scene as you see early when you come out from your bed-room. [4]

***

2471-14 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2059 Chaitra

Exam.	Regular / Back		
Level	B.E.	Full Marks	40
Programme	BEL, BEX, BCT	Pass Marks	16
Year / Part	III / I	Time	1½ hrs

Subject: - Communication II (English)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. Identify the variety label of the following sentences: [4]
   a) Have you gotten the tickets for the match?
   b) She longed for a friend in whom she could confide.
   c) Well I've just come back from Janakpur.
   d) Please could I have your address and telephone number?
2. Answer any two of the following: [4x2]
   a) Compare and contrast yourself with the traitor of "The Mother of a Traitor".
   b) How can you make the right use of science? [The Use and Misuse of Science]
   c) Make a list of the customs of your society that you don't like and describe any one of them.
3. Write a simple physical and process description of a hammer. [4]
4. Prepare a complete manuscript of a ten-minute talk on "Importance of rope ways" in Nepal in about 300 words. [8]
5. Assume that you are the coordinator of a committee formed to conduct a seminar on 'Hydropower in Nepal'. For drawing detail plan of the seminar you are going to conduct the first meeting. Draft a notice along with a three point agenda to send to all members. [8]
6. Prepare the title page, table of contents and conclusion of the report entitled 'Use of solar energy in rural areas of Nepal'. [10]

***

25/1-1 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2058 Chaitra

Exam.	Regular / Back		
Level	B.E.	Full Marks	40
Programme	BEL, BEX, BCT	Pass Marks	16
Year / Part	III / 1	Time	1½ hrs.

Subject: - Communication English II

Candidates are required to give their answers in their own words as far as practicable.
Attempt <u>All</u> questions.
The figures in the margin indicate <u>Full Marks</u>.
Assume suitable data if necessary.

1. Describe in about 150 words the site where your campus buildings are located. [4]
2. Write a brief seminar paper on the utilization of water resources in Nepal in about 200 words. [8]
3. Answer any two of the following questions: [2x4]
   a) Do you like to prevent misuse of science? If yes, how? [Use and Misuse of Science]
   b) Why didn't the American orphaned in infancy did not like to stay in America? Justify your answer. [Customs]
   c) Explain the main ideas contained in "Knowledge and Wisdom".
4. Suppose that you are the secretary of a library committee and that the library needs some more books to be procured. Call a meeting for it and write the minutes of the meeting. [6]
5. Suppose that you are the supervisor of a company which has recently installed a computer laboratory in Pulchowk Campus and that you have to submit the project completion report to your boss. Draft contents of the report including the cover page, and write abstract of it with a bibliography. [10]
6. Indicate the "variety labels" suitable to the following expressions: [4]
   a) May we smoke in here?
   b) Come in and sit down.
   c) What did she write it with?
   d) She stays in Germany from April through June.

***

25/9-24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2059 Poush

Exam.	Back		
Level	B.E.	Full Marks	40
Programme	BEL, BEX, BCT	Pass Marks	16
Year / Part	III / I	Time	1½ hrs.

Subject: - Communication II (English)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Change the following sentences into the variety as instructed in the brackets. [4]
   a) One should always look after his money. (into BrE)
   b) What country was he born in? (into formal)
   c) We got in a circle – 'We crept up' – he squealed. (into written)
   d) Shut the door, will you? (into polite)
2. Write a paragraph describing the processes involved in taking a photograph with a camera. [4]
3. Prepare a short talk in about 200 words on 'Importance of Engineering Education in Developing Countries'. [8]
4. Assume that you are the member secretary of a committee appointed by the president of the employees union of your company, draft a notice for calling the meeting along with agenda. [6]
5. Answer any two of the following: [4×2]
   a) What do you mean by 'a sense of proportion'? (Knowledge and Wisdom)
   b) Why did the mother kill her son and herself? (The Mother of a Traitor)
   c) Why did the young man return to China? (Customs)
6. Prepare the cover page, abstract and recommendations of the report to be submitted to the Chief Engineer on the construction of Bagmati Bridge near Sankhamul. [10]

***

25 / 12 - 20 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2057 Chaitra

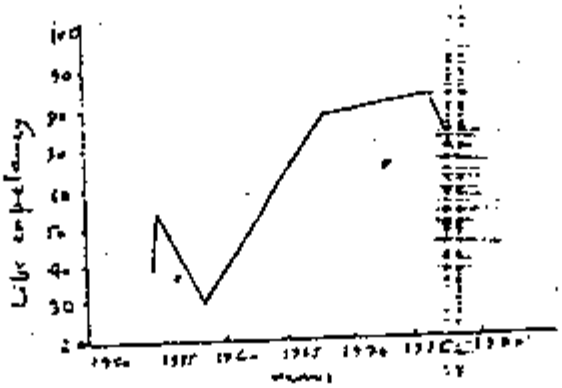
Exam.	Regular / Back		
Level	B.E.	Full Marks	40
Programme	BEL/BEX/ BCT	Pass Marks	16
Year / Part	III / I	Time	1½ hrs

Subject: - Communication II (English)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*

1. Translate the following sentences into other variety as instructed in the bracket: [4]
   a) It is said that she slipped arsenic into his tea. (into personal)
   b) 'He kind of spat', said Piggy. (into written)
   c) For whom are you waiting? (into informal)
   d) This is a different car than the one I drove yesterday. (into BrE)

2. Study the following graph about the life expectancy in China and write a description about it: [4]



3. Write a brief seminar paper on 'Contribution of the Institute of Engineering in the Development of the country'. [8]

4. A meeting has been called to take a decision about an advertising campaign to be launched by a TV manufacturing company. A proposal proposed by the advertising manager is to be presented for discussion and approval. Assuming that you have been named the secretary of this meeting, draft a notice and agenda inventing the necessary details. [6]

5. Answer any two of the following: [8]
   a) What is beauty? How can you be a beautiful man? [Beauty]
   b) Recall any one incident when you were put in odd situation due to differences in custom and give description of that. [Customs]
   c) What was the conflict in the mother's mind and how did she resolve it? [The mother of a traitor]

6. You, along with your group have just organized "Exhibition Cum Sale of Technical Equipment" and have completed successfully. Write body part of the report. [10]

***

BCT - III / I

22 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, B.Agri	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Probability and Statistic *(SH602)*

- ✓ Candidates are required to give their answers in their own words as **far** as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary tables are attached herewith.***
- ✓ *Assume suitable data if necessary.*

1. Two different sections of a statistics class take the same quiz **and the** scores are recorded below: [6]

   a) Find the range and standard deviation for each section
   b) What do the range values lead you to conclude about the variation in the two sections?
   c) Why is the range misleading in this case?
   d) What do the standard deviation values lead you to conclude **about** the variation in two sections?

Section 1	1	20	20	20	20	20	20	20	**20**	20	20
Section 2	2	3	4	5	6	14	15	16	**17**	18	19

2. Define dependent and independent events with suitable **examples**. The independent probabilities that the three sections of a costing department will **encounter** a computer error are 0.2, 0.3 and 0.1 per week respectively. What is the probability **that there** would be: [6]

   i) At least one computer error per week
   ii) One and only one computer error per week

3. Write the differences and similarities between Binominal **and** Negative Binominal Distribution. [2+3]

4. A quality control engineer inspects a random sample of 4 batteries **from** each lot of 24 car batteries that is ready to shipment. If such a lot contain six batteries **with** slight defects. What are the probabilities that the inspector's sample will contain: [5]

   i) None of the batteries with defect?
   ii) At least two of the batteries with defects?
   iii) At most three of the batteries with defect?

5. A random variable X has the following probability density function **as:** [5]

$$f(x)=\begin{cases} kx^3(4-x)^2, 0<x<1 \\ 0, \text{otherwise} \end{cases}$$

   Find the value of k, using this value of k find mean and variance of **distribution**.

6. The breakdown voltage X of a randomly chosen diode of a **particular** type is known to be normally distributed with mean 40 volts and variance 2.25 volts. **What** is the probability that the breakdown voltage will be: [5]

   i) Between 39 and 42 volts
   ii) Less than 44 volts
   iii) More than 43 volts

OR

The daily consumption of electric power in a certain city follow a **gamma** distribution with $\alpha = 2$ and $\beta = 3$. If the power plant of this city has daily capacity of 12 million kilowatt hours, what is the probability that this power supply will be inadequate on any given day?

7. State central limit theorem. An electrical firm manufactures light bulbs that have a length of life that is approximately normally distributed with mean equal to 800 hours and standard deviation of 4 hours. Find the probability that a random sample of 16 bulbs will have an average life of less than 12775 hours. [5]

8. What do you mean by sampling distribution of a sample mean and its standard Error? What would be the variance of sampling distribution of mean if sample is taken from finite population? [3+1]

9. Define partial and multiple correlation with suitable examples. Write down the properties of partial and multiple correlation. [5]

10. The following data gives the number of twists required to break a certain kind of forged alloy bar and percentage of alloying element A present in the metal. [5]

Number of twists	41	49	69	65	40	50	58	57	31	36
Percentage of element A	10	12	14	15	13	12	13	14	13	12

i) Fit the regression equation of number of twists on percentage of element A. Determine the predicted number of twists required to break an alloy when percentage of element is 20.

ii) Find 99% confidence interval for the regression coefficient (i.e.slope)

11. In a certain factory, there are two independent processes manufacturing the same item. The average weight in a sample of 250 items produced from one process is found to be 120 gram with a standard deviation of 12 gram, while the corresponding figures in a sample of 400 items from the other process are 124 and 14 respectively. Test whether the two mean weights differ significantly or not at 5 percent level of significance. [5]

12. Three trained operators work on production of new product. The productivity of the operators are recorded as below: [5]

Operators	Production			
1	10	12	14	16
2	12	11	13	16
3	14	15	12	11

Using ANOVA test whether the difference in average productivity due to the difference in operators are significant. Use $\alpha = 5\%$

OR

Define confidence level and significance level. A company claims that its light bulbs are superior to those of its main competitor. If a study showed that a sample of 40 of its bulbs has mean lifetime of 647 hours of continuous use with standard deviation of 27 hour. While a sample of 40 bulbs made by its main competitor had mean lifetime of 638 hours of continuous use with standard deviation of 31 hours. Does this substantiate claim at 1% level of significance?

13. Write down the steps for testing hypothesis on difference between two population proportions for the large sample size. [5]

14. 1072 students were classified according to their intelligence and economic conditions. Test whether there is any association between intelligence and economic condition. [6]

Economic Condition	Intelligence			
	Excellent	Good	Mediocre	Dull
Good	48	199	181	82
Not good	81	185	190	106

15. The sample of length of life of bulbs from two companies are given below: [8]

Length of life (hours)	Company	
	A	B
500-600	10	3
600-700	21	8
700-800	6	15
800-900	8	12
900-1000	21	4
1000-1100	10	5
1100-1200	2	15
1200-1300	12	13
1300-1400	19	7
1400-1500	9	7
1500-1600	3	4
1600-1700	7	6
1700-1800	5	3
1800-1900	4	2
1900-2000	1	3

i) Calculate mean length of life of bulbs for company A and company B.
ii) Calculate sample standard deviation and sample variance for given data.
iii) Which company's bulbs are more uniform?

***

22 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEI., BEX, BCT, B.Agri.	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Probability and Statistics *(SH602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary tables are attached herewith.***
- ✓ *Assume suitable data if necessary.*

1. Calculate the standard deviation from the following data regarding marks obtained by students in a test: [3+3]

Marks:	1	2	3	4	5	6	7	8	9
No. of Students	32	41	57	98	123	83	46	17	3

What will be the value of standard deviation if the marks obtained by each of the students are increased by one?

2. State Baye's theorem. A manufacturer of air-conditioning units purchases 70% of its thermostats from company A, 20% from company B and the rest from company C. Past experience shows that 0.5% of company A's thermostats, 1% of company B's thermostats and 1.5% of company C's thermostats are likely to be defective. An air-conditioning unit randomly selected from this manufacturer's production line was found to have a defective thermostat. Find the probability that company A supplied the defective thermostat. [2+4]

3. Write the differences and similarities between Binomial probability Distribution and Negative Binomial Probability distribution. [2+3]

4. The number of accident in a year attributes to taxi drivers in a city follows Poisson distribution with mean 3. Out of 1000 taxi driver, find the approximately the number of driver with: [5]

   i) No accidents in a year
   ii) More than 3 accident in a year

5. Define normal distribution. Give the condition for normal approximation of Binomial distribution and Poisson distribution. [6]

6. The time required to assemble a piece of machinery is a random variable having approximately a normal distribution with mean 12.9 minutes and standard deviation of 2 minutes. What are the probabilities that the assembly of a piece of machinery of this kind will take (a) at least 11.5 minutes (b) between 11.0 to 14.8 minutes? [4]

OR

The probability density function given by

$f(x) = cx^2, 0 < x < 3$

0, Otherwise

i) Find the value constant C?
ii) Compute $P(1<x<2)$
iii) Find the distribution function

7. What do mean by central limit theorem? Write its applications. [4]

8. The lifetime of a certain brand of an electric bulb may be considered a random variable with mean 1200 hours and standard deviation 150 hours. Using central limit theorem, find the probability that the sample mean of the lifetime with a sample of size 36, is between 1100 hours and 1300 hours. [2+4]

9. Define partial correlation and multiple correlations with suitable examples. Write two properties of each. [6]

10. Observation on the yield of a chemical reaction taken at various temperatures was recorded as follows: [4]

X (°C)	150	150	200	250	250	300	150
Y%	75.4	81.2	85.5	89	90.5	96.7	75.4

Fit a simple linear regression and estimate value of yield at 200°C.

11. An analysis for pH (acidity) in an random sample of water from 40 rainfalls showed that mean is 6.7 and s.d. is 0.5. Find a 99% confidence interval for the mean pH in rainfalls. [4]

12. As a part of investigation of the collapse of the roof of a building, a testing laboratory is given all the available bolts that connected the steel structure at three different positions on the roof. The forces required to shear each of these bolts (coded values) are as follows: [6]

Position 1	90, 82, 79, 98, 83, 91
Position 2	105, 89, 93, 104, 89, 95, 86
Position 3	83, 89, 80, 94

Perform an ANOVA to test at the 0.05 level of significance whether the difference among the sample means at the three positions are significant.

OR

The following are the average weekly losses of worker-hours due to accidents in 10 industrial plants before and after a certain safety program was put into operation:

45 and 36, 73 and 60, 46 and 44, 124 and 119, 33 and 35, 57 and 51, 83 and 77, 34 and 29, 26 and 24, 17 and 11. Use the 0.05 level of significance to test whether the safety program is effective.

13. The results of polls conducted two weeks and four weeks before an election are shown in the following table: [5]

	Two weeks before election	Four weeks before election
For republican candidate	79	91
For democratic candidate	84	66
Undecided	37	43

Use the 0.05 level of significance to test whether there has been change in opinion during the 2 weeks between the polls.

14. A manufacturer of submersible pumps claims that at most 30% of the pumps require within the first 5 years of operation. If a random sample of 120 of these pumps includes 47 which required repairs within the first 5 years, test the null hypothesis $p = 0.30$ against the alternative hypothesis $P > 0.30$ at the 0.05 level of significance. [5]

15. The following data are the ages (in months) at which n = 50 children were first enrolled in a preschool. [8]

38	40	30	35	39
47	35	34	43	41
32	34	41	30	46
55	39	53	32	32
42	50	37	39	33
40	48	36	31	36
36	41	43	48	40
35	40	30	46	37
45	42	41	36	50
45	38	46	36	31

a) Find sample mean, sample variance and sample standard deviation
b) Compute a value that measures the amount of variability relative to the value of mean

***

23 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, B.Agri.	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Probability and Statistics *(SH 602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary tables are attached herewith.***
- ✓ *Assume suitable data if necessary.*

1. Write any four characteristics of ideal measure of central tendency. For a group of 16 candidates, the mean and standard deviation were found be 20 and 5 respectively. Later it is discovered that the score 32 was measured as 23. Find the correct mean and correct standard deviation. [2+4]
2. Define dependent and independent events with examples. In a bolt factory, machines A, B and C manufacture 25%, 35% and 40% of the total respectively. Of their output 5, 4 and 2 percent are defective bolts. A bolt is drawn at random from the product and is found to be defective. What is the probability that it was manufactured from the machine B? [2+4]
3. Write any two conditions that a function is a probability mass function. It is found that 10% of the items produced by a company are defective. Out of 8 items chosen, using binomial distribution, find the probability of: (i) no defective item (ii) at least one defective item. [2+2+2]
4. Define Poisson distribution. Write the limiting case of Poisson distribution as a Binomial distribution. [2+2]
5. In a continuous distribution, whose probability density function $f(x)=Kx(2-x)$, $0\le x\le 2=0$ otherwise. Find: [2+2+2]
   a) The value of K
   b) Mean of the distribution
   c) Variance of the distribution
6. State the importance of normal distribution in engineering field with an example. [4]
7. What do you mean by the sampling distribution of sample proportion? Distinguish between parameter and statistics. [1+3]
8. State the central limit theorem. A random sample of size 100 is taken from an infinite population having the mean 76 and variance 256. What is the probability that the sample mean will be between 75 and 78? [6]
9. The following table gives the age of the cars of a certain company and annual maintenance costs : [5]

Age of cars (Years):	2	4	6	8	10
Maintenance costs (Rs.000) :	10	15	22	32	46

   Obtain the regression equation for cost related to age and also estimate the cost of maintenance for 10 yrs old car.

10. The simple correlation coefficient between temperature (X_1), corn yield (X_2) and rainfall (X_3) are $r_{12} = 0.59$, $r_{13} = 0.46$ and $r_{23} = 0.77$. Calculate the partial correlation coefficient r_{123} and multiple correlation $R_{1.23}$. [5]

11. The sample of 900 members has a mean of 3.4cms and standard deviation 2.61cms. If the population is normal and its mean is unknown, find 95% and 98% fiducial limits of true mean. [5]

12. A potential buyer of light bulbs bought 50 bulbs each of two brands. Upon testing these bulbs, he found that brand A had a mean life of 1282 hours with S.D. of 80 hours whereas the brand B had a mean life of 1208 hours with S.D. of 94 hours. Can the buyer be quite certain that the two brands do differ in quality? α = 10%. [5]

13. Describe the procedure of the test of significance of mean for sample. [4]

14. A soft drink is being bottled using two different filling machines. The standard deviation of the process for machine A and B was 0.010 and 0.015L respectively. 30 bottles were randomly sampled from each machine and the means were 2.04 and 2.07 L respectively. Can one conclude that both machines are filling the same volume of soft-drink? Test the hypothesis at $\alpha = 0.01$ level of significance. [6]

OR

Eight pots growing barley plants each were exposed to a high tension discharge, while nine similar pots were enclosed in an earthed wire cage. The number of tillers in each pot were as follows:

Caged	17	27	18	25	27	29	27	23	17
Electrified	16	16	20	16	20	17	15	21	

Test the hypothesis whether electrification exercises have any real effect on the filtering at $\alpha = 0.05$ level of significance.

15. The admission staff of a university, concerned with the success of the students it selects for admission wishes to compare the students' college performances with high school grades and test scores. The high school and college grade-point average (GPA) and student's average test (SAT) scores of 20 sampled students are follows: [2×4]

H.S. GPA	College GPA	SAT score	H.S. GPA	College GPA	SAT score
3.6	2.5	1100	3.4	3.6	1180
2.6	2.7	940	2.9	3.0	1010
2.7	2.2	950	3.9	4.0	1330
3.7	3.2	1160	3.2	3.5	1150
4.0	3.8	1340	2.1	2.5	940
3.5	3.6	1180	2.2	2.8	960
3.5	3.8	1250	3.4	3.4	1170
2.2	3.5	1040	3.6	3.0	1100
3.9	3.7	1310	2.6	1.9	860
4.0	3.9	1330	2.4	3.2	1670

a) Find, for each of the HS GPA, college GPA and SAT scores; The mean and standard deviation.

b) What is your conclusion about variability and uniformity from the analysis?

***

24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2067 Mangsir

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Probability and Statistics

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any **Seven** questions selecting **Four** from **Group A** and **Three** from **Group B**.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary figures are attached herewith.***
- ✓ *Assume suitable data if necessary.*

Group A

1. a) Find the median, the lower and upper quartiles and the inter-quartile range for the following data: 4, 0, 5, 3, 6, 2, 5, 9, 5, 3. [6]

   b) Discuss the importance and limitation of graphical representation of data. [5]

2. a) An engineering system has two components, Let us define the following events: [6]

   A: First component is good; $\bar{A}$: First component is defective.

   B: Second component is good; $\bar{B}$: Second component is defective.

   Describe the following events in terms of A, $\bar{A}$, B and $\bar{B}$ if at least one of the components is good one is good and one is defective

   The test has produced the following result: P(A) = 0.8, P(B/A = 0.85, $P(B/\bar{A}) = 0.75$ Determine the probability that

   i) The second component is good.
   ii) At least one of component is good.
   iii) Are they independent? Verify your answer.

   b) Define sample space, event and outcome with suitable example. [5]

3. a) Define the probability density function and it probability distribution. Give three engineering examples of discrete case. [5]

   b) Test for impurities commonly found in drinking water from private wells showed that 30% of all wells in a particular area have impurity A. If a random sample of 5 wells is selected from the large number of wells in the area, what is the probability that: [6]

   i) Exactly 3 will have impurity A?
   ii) At least 3?
   iii) Fewer than 3?

4. a) Define the hyper geometric distribution. Describe the conditions for Hyper geometric distribution. [5]

   b) From the DVDs manufactured by Sony, batches of DVDs are randomly selected and the number of defects x is found for each batch as given below. [6]

x	0	1	2	3	4
P(x)	0.502	0.385	0.089	0.011	0.001

   i) Identify the random variable x (discrete or continuous).
   ii) If in a batch it contains 5000CD, find the average number of defective DVDs

5. a) Define the normal distribution and standard normal distribution and its application in engineering field. [5]

b) The Precision Scientific Instrument Company manufactures thermometers that are supposed to give reading of 0°C at the freezing point of water. Tests on a large sample of these instruments reveal that at the freezing point of water, some thermometers give readings below 0° (denoted by negative numbers) and some give readings above 0° (denoted by positive numbers). Assume that the mean reading is 0°C and the standard deviation of the readings is 1.00°C. Also assume that the reading are normally distributed. If one thermometer is randomly selected, find the probability of randomly selecting one thermometer that reads (at the freezing point of water) [6]

i) The reading is less than 1.58° ii) Above -- 1.23°.

6. a) Define the joint probability mass distribution, marginal probability mass function and conditional joint probability mass function. [5]

b) The given joint probability density function is $f_{xy}(x, y) = a(x + y)$, for $0 < x < 1$ and $1 < y < 2 = 0$ elsewhere [6]

i) Find the marginal function of X and Y.

ii) Find the probability for ($0.5 < x < 0.8$ and $Y > 1.5$)

Group B

7. a) What are estimator and estimates? Describe the criteria for a good estimator. [6]

b) A commission on crime is interested in the estimation of the proportion of crimes to firearms in an area with one of the highest crime rates in a country. The commission selects a random sample of 300 files of recently committed crimes in the area and determine that a firearm was reportedly used in 180 of them. Estimate 95% and 99% confidence of the true proportion p of all crimes committed in the area in which some type of firearm was reportedly used. [6]

8. a) What are assumptions for z- test? Describe the procedures of testing proportion? [6]

b) The Edison Electric Institute has published figures on the annual value of kilowatt hours consumed by various home appliances. It is claimed that a vacuum cleaner consumed an average of 46 kilowatt hours per year. If a random sample of 12 homes included in a planned study indicates that vacuum cleaner consumes an average of 42 kilowatt hours per year with a standard deviation of 11.9 kilowatt hours, does this suggest at the 0.05 level of significance that vacuum cleaners consumes, on the average, less than 46 kilowatt hours annually? Assume the population of kilowatt hours to be normal. [6]

9. a) Describe the errors of hypothesis. Explain the procedure for test of significance of pair data [6]

b) According to Chemical Engineering an important property of fiber is its water absorbency. The average percent absorbency of 25 randomly selected pieces of cotton fiber was found to be 20 with a standard deviation of 1.25. A random sample of 25 pieces of acetate yielded an average percent of 12 with a standard deviation of 1.25. Is there strong evidence that the population mean percent absorbency for cotton fiber is significantly higher than the mean for acetate? Assume that the percent absorbency is approximately normally distributed and that the population variances in percent absorbency for the two fibers are the same. Use a significance level of 0.05. [6]

10. a) Write the properties of correlation coefficient and describe under what condition there exist only one regression line. [6]

b) On 13 April 1994, the following concentrations of pollutants were recorded at eight stations of the monitoring system for air pollution control located in the downtown area of Milan, Italy: [6]

	Station							
	Aquileia	Cenisio	Juvara	Liguria	Marche	Senato	Verziere	Zavattari
NO_2 mg /m^3	130	130	115	120	135	142	90	116
CO_2 mg/m^3	2.9	4.4	3.6	4.1	3.3	5.7	4.8	7.3

i) Show the relationship between NO_2 and CO_2 by graphical method

ii) Compute the correlation coefficient between NO_2 and CO_2

iii) Explain the relationship between NO_2 and CO_2

***

23 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2066 Magh

Exam.	Regular/Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Probability and Statistics

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any **Seven** questions selecting **Four** from **Group A** and **Three** from **Group B**.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary tables are attached herewith.***
- ✓ *Assume suitable data if necessary.*

Group A

1. a) Discuss the importance of statistics in engineering field. Write the method of construction for pie diagram. [5]

   b) Find the mean, median and mode of the following observations and compare their values. [6]

   5, 7, 3, 5, 6, 8, 5, 6, 4, 6, 25

   i) Eliminate the last observation and then find the mean, median and mode. How do these values compare with those found using the full data set?
   ii) How do possible outliers (such as 25) affect the values of these three measures of center?

2. a) Write about the terms sample space, event and outcomes. Define the addition law of probability with suitable example. [5]

   b) Disks of polycaronate plastic from a supplier are analyzed for scratch and shock resistance. The results obtained from 100 disks are summarized below: [6]

		Shock resistance	
Scratch resistance		High	Low
	High	70	9
	Low	16	5

   Let A denotes the event that a disk has high shock resistance, and B denotes the event that a disk has high scratch resistance. Determine $P(A \cap B)$, $P(A)$ and $P(A \cup B)$.

3. a) Define discrete and continuous random variables and their mean and variance. [5]

   b) Air America has a policy of routinely overbooking flights, because past experience shows that some passengers fail to show up. The random variable X represents the number of passengers who cannot be boarded because there are more passengers than the available seats. [6]

X	0	1	2	3	4
P(x)	0.85	a	0.057	0.009	0.002

   i) Find the value of a.
   ii) Find the average passengers who cannot board due to over passengers?

4. a) What are the conditions for Binomial experiment and also define the Binomial distribution. Write one example of Binomial experiment. [5]

   b) For the case of the thin copper wire, suppose that the number of flaws follows a Poisson distribution with a mean of 2.3 flaws per millimeter. Determine the probability of [6]

   i) exactly 2 flaws in 1 millimeter of wire.
   ii) at least 2 flaws in 1 millimeter of wire
   iii) at 2 flaws in 1 millimeter of wire

5. a) Write the importance of Normal distribution and its area property. [5]

b) An auditor has reviewed the financial records of a hardware store and has found that its billing errors follow a normal distribution with mean and standard deviation equal to \$15 and \$1 respectively. [6]

i) What proportion of the store's billings are in error by more that \$1?
ii) What is the probability that a billing represents an overcharge of at least \$1.50?
iii) What is the probability that a customer has been undercharged from \$0.50 to \$1.00?

6. a) Define joint probability density function and marginal probability density function. [5]

b) If two random variables have the joint density function as follows: [6]

$$f(x,y) = \begin{cases} \frac{6}{5}(x+y^2) & \text{for } 0 < x < 1,\ 0 < y < 1 \\ 0 & \text{otherwise} \end{cases}$$

i) Find the probability that $(0.2 < X < 0.5$ and $0.4 < Y < 1)$.
ii) Find marginal probability function for X.

Group B

7. a) Define parameter and statistics. Write the difference between point estimation and interval estimation with suitable examples. [6]

b) An economist wants to estimate the mean income for the first year of work for college graduates who have had the profound wisdom to take a statistics course. How many such incomes must be found if we want to be 95% confident that the sample mean is within \$500 of the true population mean? Assume that a previous study has revealed that for such incomes, σ = \$6250. [6]

8. a) Discuss the errors of Hypothesis testing with suitable example. [6]

b) The life in hours of a battery is known to be approximately normally distributed. A random sample of 10 batteries has a mean life of 40.5 hours and standard deviation 1.25 hours. Is there evidence to support the claim that battery life exceeds 40 hours? Use $\alpha = 0.05$. [6]

9. a) Discuss differences between z-test and t-test. Describe the procedure of test of significance between two population proportions. [6]

b) In investigating which of two presentations of subject matter to use in a computer-programmed course, an experimenter randomly choose two groups of 18 students each, and assigned one group to receive presentation I and the second to receive presentation II. A short quiz on the presentation was given to each group and their grades recorded. Do the following data indicate that a difference in the mean quiz scores (hence a difference in effectiveness of presentation) exists for the two methods? [6]

	Mean	Variance
Presentation I	81.7	23.2
Presentation II	77.2	19.8

10. a) Distinguish between correlation coefficient and regression coefficient and write its importance in engineering field. [6]

b) An article in the Tappi Journal (March, 1986) presented data on green liquor Na_2S concentration (in gm/lit) and paper machine production (in tons per day). The data (read from a graph) are shown as follows: [6]

X	40	42	49	46	44	48	46	43
Y	820	830	890	870	890	910	950	960

i) Fit a simple linear regression model with y = green liquor Na_2S concentration and x = production
ii) Find the fitted value of y corresponding to x = 915 and the associated residual.

***

23 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2066 Kartik

Exam.		Back	
Level	BE	Full Marks	80
Programme	BEI, BEX, BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Probability and Statistics

- Candidates are required to give their answers in their own words as far as practicable.
- *Attempt any **Seven** questions selecting **Four** from **Group A** and **Three** from **Group B**.*
- ***All** questions carry equal marks.*
- ***Necessary tables are attached herewith.***
- *Assume suitable data if necessary.*

Group A

1. a) Discuss the importance and limitation of graphical and diagrammatical representation of data. [3]

   b) The nine measurements that follow are temperature determinations at various location beneath the surface of the Lake Ontario, as reported in Limnology and Oceanography 4.45, 3.91, 3.86, 3.93, 3.94, 3.90, 3.80, 3.73, 3.69. Compute [6]

   i) The sample mean and median of these data values
   ii) If a constant C is added to each x in a sample, yielding $y_i = x_i - c$. how do the sample mean and median of the y_i related to the mean and median of the x_i.

2. a) Explain the following terms in brief. [3]

   i) Equally likely events ii) Independent events iii) Mutually exclusive events

   Support your answer with suitable example.

   b) Suppose that a person who fails in examination is allowed to retake the examination but cannot take the examination more than three times. The probability that a person passes the exam on the first, second, or third attempt is 0.7, 0.8, or 0.9 respectively. [6]

   i) What is the probability that a person takes the exam twice before passing it?
   ii) What is the probability that a person takes the exam three times before passing it?
   iii) What is the probability that a person passes this exam?

3. a) Discuss difference between Binomial distribution and Negative Binomial distribution with suitable example. [3]

   b) If the probability that a fluorescent light has a useful life of at least 500 hours is 0.85, find the probability that among 20 such lights. [6]

   i) 18 will have a useful life of at least 500 hours.
   ii) At least 15 will have a useful life of at least 500 hours.
   iii) At least two will not have useful life of at least 500 hours.

4. a) Discuss the difference between the discrete and continuous probability distribution. Support your answer by suitable example. [5]

   b) A city planner claims that 20% of all apartment dwellers move from their apartments within a year from the time they first moved in. In a particular city, 7 apartment dwellers who had given notice of termination to their landlords are to be interviewed. [6]

   i) If the city planner is correct, what is the probability that 2 of the 7 had lived in the apartment for less than one year?
   ii) What is the probability that at least 6 had lived in their apartment for one year or more?

5. a) Define Normal distribution and Standard Normal distribution and discuss its area property. [5]

   b) An industrial engineer has found that the standard household light bulbs produced by a certain manufacture have a useful life that is normally distributed with a mean of 250 hours and a variance of 2500. [6]

   i) What is the probability that a randomly selected bulb from this production process will have a useful life in excess of 300 hours?
   ii) What is the probability that a randomly selected bulb from this production process will have a useful life between 190 and 270 hours?
   iii) What is the probability that a randomly selected bulb from this production process will have a useful life not exceeding 260 hours?

6. a) Define Joint probability mass function and marginal probability mass function with example. [5]

b) The joint density function of two random variables X and Y is

$$f(x,y)=\begin{cases} cxy \text{ for } 0\le x\le y \text{ and } 1\le y\le 5 \\ 0 \text{ otherwise} \end{cases}$$

i) Find the constant C- ii) Find $P(1\le x\le 3,\ 3\le y\le 4)$

Group B

7. a) Explain the principle of maximum likelihood estimation. Find the maximum likelihood estimator for the parameter of a Poisson distribution. [6]

$$p(x;\lambda)=\frac{e^{-\lambda}\lambda^{x}}{x!};\ 0\le x\le\infty$$

b) In measuring the tensile strength of two alloys, strips of the alloys were subjected to tensile stress and the force (measured in pounds) at which the strip broke recorded for each strip. The data are summarized below. [8]

	Alloy 1	Alloy 2
Sample variance	150.5	160.2
Sample mean	23.72	36.37
Number	35	35

Use these data to estimate the true mean difference in tensile strength by finding a point estimate for $(\mu_1-\mu_2)$ and calculate the margin of error in estimation.

8. a) Discuss types of error in testing of hypothesis. Describe the test procedure of test of significance of mean for small sample. [6]

b) A random sample of 100 recorded deaths in the US during the past year showed an average life span of 71.8 years. Assuming a population standard deviation of 8.9 years, does this seem to indicate that the mean life span today is greater than 70 years? Use a 0.05 level of significance. [6]

9. a) What are the assumptions of t test? Discuss the procedure of test of significance of difference between two means for small sample. [6]

b) The owner of a small manufacturing plant is considering a change in salary base by replacing an hourly wage structure with a per-unit rate. She hopes that such a change will increase the output per worker but has reservations about a possible decrease in quality under the per-unit plan. Before arriving at any decision, she forms 10 pairs of workers so that within each pair two workers have produced about the same number of items per day and their work has been of comparable quality. From each pair, one worker is randomly selected to be paid as usual and the other is to be paid on a per-unit basis. In addition to the number of items produced, a cumulative quality score for the items produced is kept for each worker. The quality scores follow: (A high score is indicative of high quality) [6]

	Rate	
Pair	Per Unit	Hourly
1	86	91
2	75	77
3	87	83
4	81	84
5	65	68
6	77	76
7	88	89
8	91	91
9	68	73
10	79	78

Do these data indicate that the average quality for the per-unit production is significantly lower than that based on an hourly wage?

10. a) Explain clearly why there are usually two lines of regression. Point out the case when there is only one line of regression existing. [6]

b) The following data pertain to resistance (ohms) and the failure time (min) of certain overloaded resistor. [6]

Resistance	43	29	44	33	33	47	34	31	48	34
Failure time	32	20	45	35	22	46	28	26	37	46

Compute the simple correlation coefficient.

***

23 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Instrumentation II *(EX602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) How do you select a microprocessor or a microcontroller for your project? [3]

   b) Explain the block diagram of a microprocessor based instrumentation system. What are the basic features of a microprocessor based instrumentation system? [5]

2. a) Write a short note on PCI Bus. [2]

   b) Interface a keyboard and a printer in mode 1. Port A is designed as input for keyboard with interrupt I/O port B is designed as output for printer with status check I/O. Draw the mapping circuit and write the control word and address map. [6]

3. a) Design a cable that has a USB connector at one end and an RS-422 connector at the other end. Assume the USB is connected to a laptop and the RS-422 connector is attached to a printer. Your design should include the following: [6]

   i) Technical names of the pins and wires involved in the design.
   ii) Intermediate chips to maintain voltage uniformity between the two standards.
   iii) Neat and labeled sketch of the wiring between the two standards.

   b) What is a USB interface chip? Why are they required? Compare and contrast USB device interface chips and USB host interface chips. [4]

4. a) Calculate the values of the LSB, MSB, resolution and full-scale output for an 8-bit DAC for the 0 to 10V range. [2]

   b) How can you design a DAC with 12 bit resolution with the 8085 microprocessor having 8 bits data lines? Explain with suitable block diagram. [6]

5. a) What are the essential components of data acquisition system? Explain with the help of block diagram. [4]

   b) Explain Bluetooth network topology in brief. What are the advantages of Bluetooth applications? [4]

6. a) What are the characteristics of a safety ground? [2]

   b) Describe different types of noise coupling mechanism in brief. How do you check their predominance in the circuit? [4]

7. A data logger receives signals from a Bluetooth scatternet. The scatternet consists of three piconets and within each piconet there are four bluetooth devices. The piconets communicate within themselves and amongst each other using the master/slave protocol. [10]

   a) Describe an analog transmission mechanism to capture the blue tooth signals by the data logger. Draw a complete system block diagram.
   b) Describe the mater/slave protocol that is present in blue tooth piconets and scatternets
   c) Draw the scatternet topology depicting the scenario maintained in the question. Make sure you adhere to the rules of the masters/slave protocol.

8. a) While designing an electronic instrument you should group circuits according to their characteristics to maintain the correct operation of each circuit. What are the considerations during grouping components and circuits and what is the impact of such grouping? [4]

   b) What are the factors that derive reliability of an electronic system? [2]

9. Compare and contrast the three traditional models of software development with respect to their strengths and weaknesses. Propose a fourth software development model that outperforms the classical methods and justify your choice in terms of reliability, maintainability, flexibility, portability and reusability. [4]

10. Draw the complete block diagram of industrial process control system involved in your case study. Explain why you want to implement this control system over existing one in terms of cost, manpower and plant automation. What problems you might face after implementating this control system. [12]

***

24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2069 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Instrumentation II *(EX602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Explain briefly the concept of DMA. Draw circuit Diagram of an interfacing circuit containing 4 KB ROM and 8 KB RAM. Assuming Base address in 4000H. You also need to draw write and read cycle timing diagram. [2+6]
2. In a microprocessor based system, an 8255A PPI card is used to interface a keyboard and a printer to the processor. The 8255A PPI is interfaced with the 8085 microprocessor in the system such that the base address of 8255 A PPI is 4044 H.
   a) What are the addresses captured by the card? [1]
   b) Draw the complete interfacing circuit of 8255A PPI with 8085 microprocessor for the given system. [3]
   c) If the printer is interfaced to port A and the keyboard is interfaced to port B of the PPI generate the control word to initialize the 8255A PPI with proper explanations. Both printer and keyboard use 8-bit parallel data transfer with handshaking. [2]
   d) Derive the control word to enable interrupt request to the microprocessor by port A of 8255A PPI in above system, with proper explanations. [2]
3. a) Compare the USB standards: USB 1.1 and USB 2.0 [3]
   b) Describe simplex, half duplex and full duplex operation using RS-232 port. [7]
4. What are types of errors present in a A/D or D/A converters? With necessary diagram explain the interfacing a ADC using interrupt. [3+5]
5. a) Explain different network topologies of Bluetooth device with appropriate diagrams. [4]
   b) What is a data logger? Explain the desirable characteristics for a data logger. [1+3]
6. Explain different types of Noise coupling Mechanism with concept of Pseudo impedance. [6]
7. What are the reasons for using low power? Mention the guidelines to be considered for low power design. [2+4]
8. A careful circuit layout not only makes the production of circuit boards easier but also makes them less error prone. What rules does a designer have to follow while routing signal tracks in PCBs in order to avoid the effects of impedance mismatch and crosstalk? [3+3]
9. What is fault tolerance in software? What do you mean by roll-back recovery and roll-forward recovery? Explain different types of bugs in software. [2+2+4]
10. a) What are the types of Microprocessor based system used in instrumentation system? How it makes more benefits in industry? [3]
    b) Explain detail about different processing plant which you have studied in case study. Also draw the block diagram for further improvement of these all plant and overall system. [9]

***

34 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Computer Graphics *(EX603)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Differentiate Random and Raster display technology. [4]
2. Compare between DDA and Bresenham's line drawing algorithm. Derive and write mid-point algorithm to draw ellipse. [10]
3. The reflection along the line y = x is equivalent to the reflection along the X-axis followed by counter clock wise rotation by α (alpha) Degree. Find the angle α. [10]
4. Write rotation matrix in clockwise direction with respect to x-axis, y-axis and z-axis. Rotate the object (0, 0, 0), (2, 3, 0), (5, 0, 4) about the rotation axis y =4. [3+7]
5. Write down properties of Bezier curve. Find equation of Bezier curve whose control points are P0(2,6), P1(6,8) and P2(9,12). Also find co-ordinate of point at u = 0.8. [10]
6. Explain boundary representation technique to represent the 3D object with suitable example. How can you find the spatial orientation of a surface? [8+2]
7. Explain z-buffer algorithm along with necessary steps needed to calculate the depth. What is its drawback? [10]
8. Define the terms: [10]

   i) Ambient light
   ii) Lambert cosine law
   iii) Diffuse reflection
   iv) Specular reflection

   Also find equation for intensity of point by using Phong illumination model.
9. What is openGL? Explain callback function. [4+2]

***

34 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Computer Graphics *(EX603)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. How much time is spent scanning across each raw of pixels during screen refresh on a raster system with resolution 1024×768 and a refresh rate of 60 frames per second? [4]
2. Mention the disadvantages of DDA method. Write the complete Bresenham's line drawing algorithm and using midpoint circle drawing algorithm calculate the co-ordinate on the first quadrant of a circle having radius 6 and centre (20,10) [2+4+4]
3. State the conditions of point clipping. Perform clipping operation for the following using Liang Barskey line clipping algotithm: [2+6]

   Clipping window: (Xmin, Ymin) = (2,5) and (Xmin, Ymin) = (35,50)

   Line: (x1, y1) = (-2,2) and (x2,y2) = (45,40)
4. Define window and view port. Describe three dimension windows to view port transformation with matrix representation for each step. Derive oblique projection matrix with necessary assumptions. [1+4+5]
5. Define Hermite Interpolation in defining a curve. Use it to find the blending function of a parametric cubic curve in 2D graphics. [2+6]
6. Describe polygon, Vertex and Edge table of polygon. How these terms are important in computer graphics. [8]
7. Describe z-buffer method for visible surface detection in detail. State its limitation and recommended method that addresses it. [7+3]
8. Calculate the total intensity using phone secular reflection model by considering all type of light sources. [8]
9. Compare and Contract between Gouraud and Phong Shading Model. [8]
10. Write short notes on: [3×2]
    a) Call back function
    b) Open GL

***

36 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2066 Magh

Exam.	Regular/Back		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Computer Graphics

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ ***All** questions carry equal marks.*
- ✓ *Assume suitable data if necessary.*

1. Devise Bresenham's decision parameters for a straight line with negative slope with $|m| < 1$, applying left to right sampling. Assume that the line is in first quadrant.
2. Calculate all the pixels of a circle with radius = 10 and center at (50, 50) in the first octant starting from (50, 60) proceeding to positive x axis direction.
3. Justify with necessary matrix operations that the two successive rotations in 2-D is additive.
4. A 2 units length cube with a diagonal passing through (0,0,0) and (2,2,2) is spinning about an axis parallel to z-axis with angle 180 degree. Obtain the matrix involved for the operation.
5. Derive appropriate mathematical relation to transform 2-D scene (points) in world window to normalized view window.
6. Mention different types of projections. Derive oblique projection matrix with necessary assumptions.
7. Discuss Phong Illumination model with distance consideration.
8. Write short notes on:
   a) Backface Detection Algorithm
   b) Flat Panel Display

***

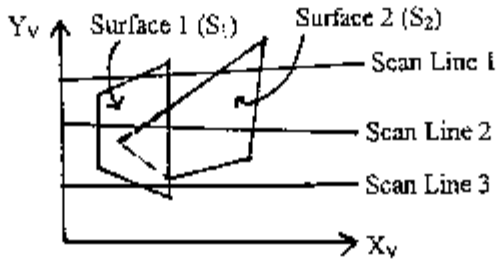
36 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2065 Chaitra

Exam.	Regular/Back		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Computer Graphics

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What is computer graphics? Write its applications? [2+4]
2. Calculate the intermediate pixel positions of a line with end points (55,22) and (49,14) and plot it graph. [8]
3. Convert these homogenous points to Cartesian coordinates (8, 4, 2) and (12, 6, 3). [2]
4. Obtain the oblique and perspective projection of the coordinate position (x, y, z) on the view plane with necessary derivations. [4+6]
5. Derive the composite transformation matrix for reflection about the line $y = mx + b$. [6]
6. How is z-buffer method used to make closer objects display in front of farther ones? Explain with its algorithm. [4]
7. Using scan-line method identify the visible portions of surfaces for pixel positions along the scan lines 1, 2 and 3. Assume surface S_1 is closer to the view plane. The dashed lines indicate the boundaries of hidden surfaces. [6]



8. How transparency effects are implemented for identifying visible portions of surfaces in computer graphics? [4]
9. Obtain the end points of a line that connects $P_1(0,120)$ and $P_2(130,5)$ after cohen-sutherland clipping. The clip window has the following parameters. $xw_{min} = 0$ $yw_{min} = 0$ $xw_{max} = 150$ $yw_{max} = 100$. [10]
10. Assume that you have an algorithm that can fill 3-D triangles with a constant color. Explain what additional information and additions to the algorithm are required to Gouraud shade the triangles. [8]
11. Explain phong model for specular reflection with equations. [6]
12. Write short notes on: (any four) [2.5×4]
    a) Raster and Vector Display
    b) Graphical Languages
    c) Program Debugging Techniques
    d) 2D Rotation
    e) Aliasing Effect

***

36 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2065 Kartik

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Computer Graphics

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1) a) It is possible to design a color CRT that uses a single electron gun and does not have a shadow mask. The single beam is turned on and off at the appropriate times to excite the desired phosphors. Why such a CRT be more difficult to design, as compared to the shadow-mask CRT? [4]

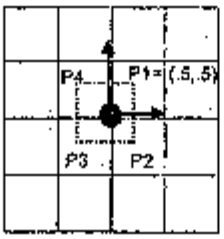
b) What is antialiasing and how does it help to reduce the apparent jagginess of a straight line? [4]

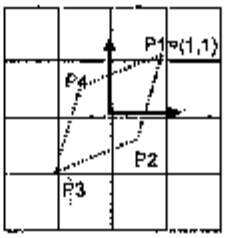
c) How does the drift due to cumulative error build up vary as a function of the length of the line and as a function of the precision of m? [4]

2) a) Discuss the considerations in plotting a straight line. [4]

b) Draw a line using Bresenham's line drawing algorithm joining segment A (-3, 3) and B(5, -2). [10]

3) a) Describe the 2D transformation matrix that shears the unit square centered at the origin as shown on the left to the parallelogram on the right of figure below. Show your work. [6]





b) A triangle in object coordinates is represented by the following three points, where each point has the format: (x, y, z); P0= (1, 5, 10), P1= (3, 21, 10), P2= (5, -5, 10). Find a combination of transformations that will represent the triangle by the following points in world coordinates: P0'= (-1, 6, 13), P1'= (3, 14, 13), P2'= (7, 1, 13). Write the transformation as a series of matrix multiplications in the correct order. [10]

4) a) Sketch a block diagram of the transformations involved in transforming a point from world coordinates to the device coordinates. Label the intermediate coordinate frames. [4]

b) Explain how the surface normal vector can be used as the basis of a simple hidden surface removal algorithm. In what circumstances will such algorithms fail? [4]

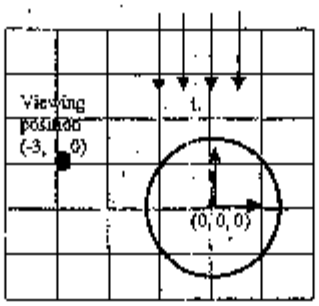
5) a) A triangle has vertices P0= (-1, 6, 13), P1= (3, 14, 13) and P2= (7, 1, 13). Calculate its vertices after orthographic projection if the projection plane, zv= -3. [4]

b) A triangle has vertices P0= (-1, 6, 13), P1= (3, 14, 13) and P2= (7, 1, 13). Calculate the projected coordinates if the perspective projection has projection reference point at (1, 1,-4) and the projection plane, zv= -3. [10]

6) a) Light a triangle using the Phong Illumination model.
P1 = (1, 1, 1), P2 = (0, 2, 1), P3 = (0, 0, 1). ka = 0.7, kdiff = 0.9, kspec = 0.6, η = 10,
White ambient intensity = 0.1, White point light position = (1, 1, 5)
White point light intensity = 0.5
Viewer position = (1, 2, 5)
What's the intensity at the centroid of the triangle, P = (0.333, 1, 1)? [10]

assuming white object (r,g,b) = (1,1,1)

b) The scene below consists of: a sphere of radius p2 centered at origin with kd = (1, 0, 0) and ks = (1, 1, 1); a parallel (directional) light L = (0,−1, 0) with Id = Is = (1, 1, 1); and viewing position at (−3, 1, 0). Assume there are no other light-sources. [2x3]



i. At what point (coordinates) on the sphere will viewing position get maximal specular reflection (white dot)? Give reason.

ii. At what point (coordinates) on the sphere will viewing position get maximal diffuse illumination (red dot)? Give reason.

36 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2064 Shrawan

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Computer Graphics

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Define computer graphics? Briefly describe the history of computer graphics. Explain how computer graphics finds its application in different field. [2+3+5]
2. Explain how raster-scan system and random-scan system work? What are the advantages of raster-scan system over the random-scan system? [6+2]
3. The vertices of a triangle are given to be A(8,7), B(10,6) and C(8,4). [10]
   a) Translate the triangle so that the vertex A is at (1,9).
   b) For the translated triangle in 3(a), get the vertices of the reflected image of the triangle, the axis of reflection being $y = x + 3$.
   c) For the reflected image of the triangle computed in 3(b), rotate it 45° clockwise about point (2,2).
   d) Taking x-direction shearing factor $sh_x = 0.5$, perform the x-direction shear relative to $y_{ref} = 1$, for the rotated triangle computed in 3(c).
4. Write down the algorithm to draw an ellipse in raster conversion system along with the necessary derivation of the equation. [10]
5. Explain how can you identify the visible surface using scanline method? Explain in detail. Discuss the limitation of back-face (or plane equation) method of identifying visible surface. [7+3]
6. Describe how Normal Vector Interpolation technique can be used in rendering a realistic 3D object. Compare the performance of this method with Intensity Interpolation method. What are the assumptions that should be valid for an accurate rendering using flat shading method? [6+2+2]
7. Define diffuse reflection and specular reflection. Derive the equation of basic illumination model consisting of ambient light, diffuse reflection and specular reflection for multiple light sources. Consider the intensity attenuation factor as well. [2+8]
8. Write short notes on (any four): [3×4]
   a) Perspective Projection
   b) Program Debugging Techniques
   c) Open Graphics Language
   d) Project Report
   e) Fluorescence and Phosphorescence
   f) 3D Shearing

***

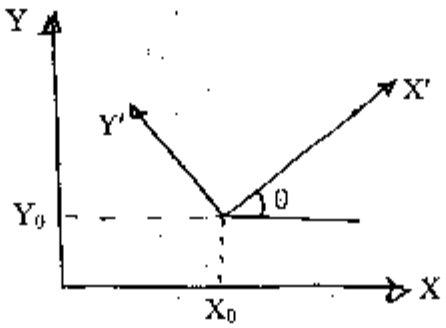
36 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2063 Kartik

Exam.	Regular/Back		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Computer Graphics

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Explain the purpose of computer graphics? Write down some of the applications where the computer graphics is used. [5+5]
2. What are the basic concepts of Bresenham line drawing algorithm? Write its algorithm. What are the advantages of Bresenham line drawing algorithm over digital differential analyzer line drawing? [2+4+4]
3. Digitize the octant of a circle with radius r = 7 and centre (20, 30). [10]
4. What do you understand by homogeneous co-ordinate system? Explain the transformation matrix between two co-ordinate system from X'Y' to XY or vice versa as follows. [4+6]



5. What are the data requirements in polygon surface representation? Explain vertex, edge and surface table using a suitable example. What are the guidelines to generate error free table. [3+4+3]
6. What do you understand by object-space and image space methods for visible surface detection algorithm? Explain the z-buffer method and write its algorithm. [4+6]
7. Explain the term illumination model. Explain the illumination model for [2+4×2]
   a) Diffuse Reflection
   b) Specular Reflection
8. Write down the short notes on any four: [2.5×4]
   a) Raster Display Architecture
   b) Modelling Co-ordinates and World Co-ordinates
   c) Graphics Software
   d) Program Debugging Techniques
   e) Projection Methods
   f) Project Development

***

36/2-27 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2062 Jestha

Exam.		Back	
Level	B.E.	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Computer Graphics

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) What do you understand by computer graphics? Explain different fields of computer graphics? [4]
   b) Explain the principle of operation of following devices: (a) mouse (b) light pen. [8]
2. What are the drawbacks of scan conversion line drawing algorithm? How it can be eliminated? Explain in detail. [16]
3. What do you understand by projection? Explain about the parallel projections and derive the conditions for the oblique projection. [16]
4. How many ways can we remove hidden surface? Explain any one method in detail. [16]
5. a) How can you render surface using Phong shading? Differentiate between Phong shading and Gouraud shading. [10]
   b) Discuss the following transformation: [10]
      i) 3D Shear
      ii) 3D Rotation
      iii) 2D Reflection

***

36 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2062 Bhadra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Computer Graphics

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Differentiate between image processing and computer graphics with example. Explain the application of computer graphics. [9]
2. Explain the vector display technology with its advantages and disadvantages. [9]
3. Digitize the line with endpoints (20, 10) and (30, 18) with Bresenham line drawing algorithm. [9]
4. Explain the midpoint circle drawing algorithm in detail. [9]
5. After rotating a triangle with vertex A(0, 0), B(1, 7) and C(9, 2) in 60 degree anticlockwise about point (10, 10), what will be the new vertex values? [9]
6. Derive the view port mapping coordinates provided window coordinates, in detail. [9]
7. What do you understand by projection? Derive the equation for oblique parallel projection. [9]
8. Explain the phong model for specular reflection with equations. [9]
9. Write short notes on: [2×4]
   a) Graphical Languages
   b) Project Development Cycle

***

36/6-16 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2061 Ashwin

Exam.	Regular / Back		
Level	B.E.	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Computer Graphics

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Explain about the application of computer graphics. [4]

   b) Explain the following terms [8]

   i) Fluorescence
   ii) Phosphoresce
   iii) Persistence
   iv) Critical Fusion Frequency

2. How can you utilize the symmetric property while drawing a circle? Explain the midpoint circle-drawing algorithm along with the necessary derivations. [16]

3. What do you understand by projection? Explain about the perspective projections with derivations. [16]

4. Explain any one of the image space method used in removing hidden surfaces in detail. [16]

5. a) Explain Gouraud shading method and state why it is also called intensity interpolation method? Explain with derivation. [10]

   b) Explain the two-dimensional viewing transformation in detail. [10]

***

36/8-12 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2060 Bhadra

Exam.	Regular / Back		
Level	B.E.	Full Marks	80
Programme	BEX/BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Computer Graphics

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. a) How can you assign Intensity Level to the CRT? Explain with suitable equation and graph. 6
   b) Explain the following input devices used in the Computer Graphics: 6
      i) Keyboard
      ii) Mouse

2. Discuss the following transformation: 16
   a) 3D Translation
   b) 2D Translation
   c) 3D Shear
   d) 2D Rotation

3. How color can be generated in the color CRT? Explain Precesion in Line type of color CRT used in the computer graphics. 16

4. Explain in detail about Mid Point Ellipse Drawing Algorithm. 16

5. a) How curved surface can be generated using Bezier Curve? 10
   b) How can you render surface using Gouraud Shading? 10

(5)

3646-10 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2059 Shrawan

Exam.	Regular / Back		
Level	B.E.	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Computer Graphics

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. a) Briefly describe low computer graphics finds its applications in different fields of engineering. [6]
   b) Write down the block diagrams of vector and raster graphics display architecture and describe the major functions of each block. [10]
2. a) Define persistence, critical fusion frequency refresh rate, resolution, fluorescence and phosphorescence of a monitor. [5]
   b) Describe the working principles of different types of tablet input device. [5]
3. Write down the midpoint algorithm to draw an octant of an ellipse along with necessary derivations. [4+6]
4. a) Describe the following transformations with their matrix representation: [4+3]
      i) 2D fixed point scaling
      ii) 2D shear
      iii) 3D rotation
   b) What are different steps of 2D window to view port transformation? Describe with matrix representation at each step. [6]
5. a) Explain, how a 3D object is represented using polygon surface method? What major considerations are required to avoid errors in this method? [5+3]
   b) Describe how normal vector interpolation technique can be used in rendering a realistic 3D-object? [8]
6. What are the two classes of visible surface detection techniques? Discuss the scan-line method of visible surface detection along with its algorithm. [2+4+4]

***

35 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

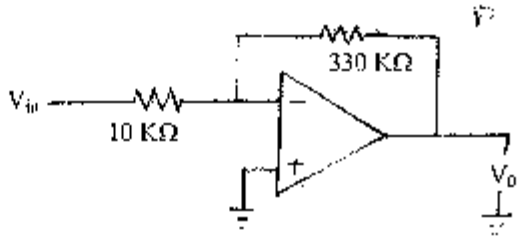
Subject: - Advanced Electronics *(EX601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. What are the basic requirement for current mirror circuit? Why output current of simple current mirror circuit not being exactly equal to the input reference current? Determine the emitter resistance, R_E for wilder current source which supplies 10 μA from a reference of current of 1 mA. [2+2+3]

2. The op amp in the given figure has slew rate of 0.5 V/μS. The input signals are as follows: [4+3]

$V_1 = .01\sin 10^6 t$
$V_2 = .05 \sin (350 \times 10^3)t$
$V_3 = .1 \sin (200 \times 10^3)t$
$V_4 = .1 \sin (50 \times 10^3)t$



Determine whether the output will get distorted due to slew rate limitation? Find the new value of feedback resistor such that none of the signal gets distorted.

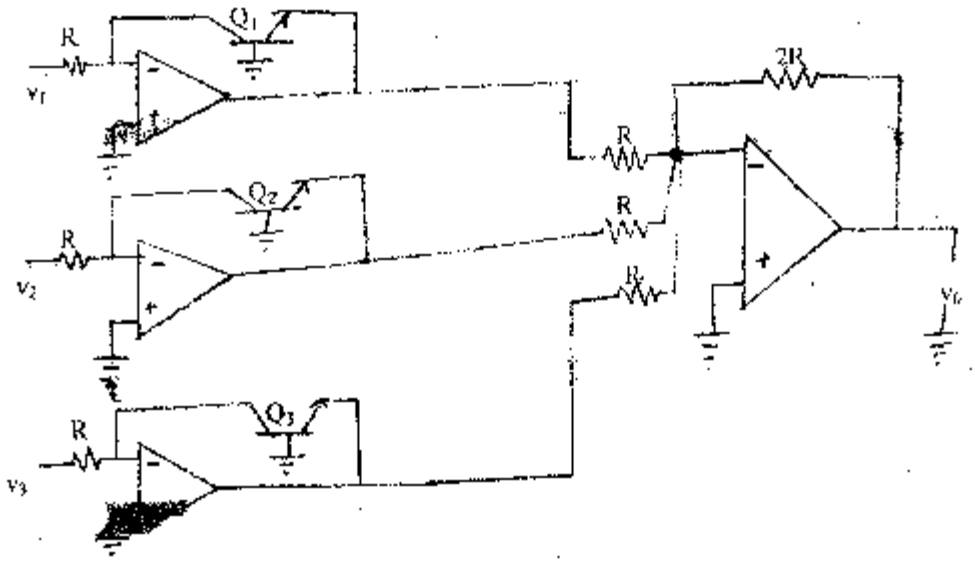
3. Discuss noise in operational amplifier circuits with necessary diagram and suggest the measures to be taken to minimize the interval noise. [7]

4. Draw a circuit diagram for 5 bit R-2R (voltage type) DAC. If the reference voltage for the DAC is 1V, the binary input is 10110, find the output voltage. [4+2]

5. Draw the block diagram of Dual-slope type ADC and explain about its working principle with necessary diagram. Explain briefly about integral linearity of the DAC. [6+2]

6. What are the advantages of 3 op-amp (Isolation Amplifier) IA over 1-op amp and 2 op-amp IA? List out the application of Isolation amplifier. Explain the block diagram of electromagnetically coupled isolation amplifier. [2+2+3]

7. Find the relationship of input and output voltage in the following figure. [4]



8. Why log-Antilog circuits are required? Draw the circuit diagram of analog multiplier and explain it. [1+6]

9. Mention the drawback of DIAC? Describe the operating principle of TRIAC with necessary diagrams and explain why it is called four quadrant operation? [2+5]

10. What are choppers? Explain the working principle of single phase, full bridge inverter with necessary diagrams and waveforms. [2+5]

11. What is an inverter? Explain the Buck switching regulator with required necessary diagram and waveforms. [2+5]

12. Write short notes on: [3+3]

a) Application of Log and Antilog Amplifier

b) SMPS

***

35 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Advanced Electronics *(EX601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What are the essential condition for a current mirror circuit to work? Derive an expression for an output resistance of widlar current source. [2+5]
2. Define slew Rate of an operational amplifier. The inverting op-amp with Rf = 330 KΩ and R1 = 10 KΩ has a slew rate of 0.5 v/μs with input signal equal to 0.1sin (200000t). Determine whether the output will be distorted due to slew rate limitation, if so find remedy. [2+5]
3. What is input offset voltage and input offset current of an operational amplifier? Find the output resistance of closed loop op-amp. [2+5]
4. What are the advantages of R-2R type DAC? Derive the expression for output voltage in inverted R-2R type DAC. [2+5]
5. Explain the working principle of a dual slope ADC and prove that its output is independent of RC time constant.Justify that the converter is inherently noise immune. [4+3]
6. Explain the operation of Electromagnetic Coupled Isolation amplifier. Certain Instrumentation amplifier has a gain of 40dB and CMRR of 90dB. It is used in a noisy environment in which the signal has a level of 35 mV and common mode noise level of 150 mV. Determine common mode gain, signal output and noise output. [4+3]
7. Derive the transfer function for Log amplifier using matched transistor. [5]
8. What do you understand by four-quadrant multiplier? Draw the circuit diagram and derive expression for its output voltage. [2+5]
9. Can two complementary BJTs be used to make SCR? Explain about turning OFF of SCR. [2+5]
10. Classify chopper on the basis of power flow. Explain the principle of step-up converter with resistive load. [2+5]
11. A buck regulator has an input voltage of Vs = 14v the required output voltage is Va = 6v at R = 500Ω and peak to peak output voltage ripple is 15mv the switching frequency is limited to 20KHZ. If the peak to peak ripple current of the inductor is limited to 0.7A determine: (a) the duty cycle (b) Filter inductance L (c) Filter capacitance C and (d) critical values of L and C. [1+2+2+2]
12. Discuss an ac analysis of differential amplifier with necessary diagrams and mathematical expressions. [5]

***

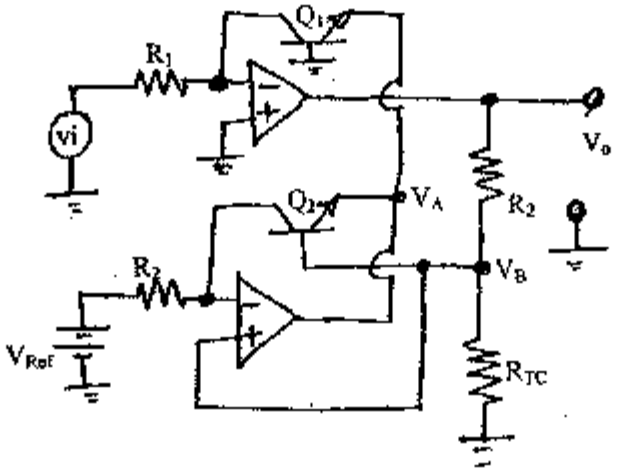
36 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2069 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Advanced Electronics *(EX601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What are the reasons for the output current of a simple current mirror not being exactly equal to the reference current? Show that the voltage gain of a differential amplifier with active load is doubled compared to that with passive load (R_C). [2+5]
2. Show the effect of input bias current in op-amp circuit . Derive the expression for closed loop output impedance of inverting op-amp configuration. [4+3]
3. The inverting opamp configuration has a feedback resistance of 470 KΩ and an input resistance of 10 KΩ. If the input signal is 0.1 sin (2000001), determine whether the output will be distorted due to slew rate limitation of opamp. If so, find a remedy. The opamp has a slew rate of 0.5V/μs. [7]
4. Draw circuit for 4-bit inverted R-2R ladder network type DAC. Find expression for output voltage and explain why an inverted R-2R ladder DAC is better than R-2R ladder DAC. [2+4+1]
5. Explain the working principle of dual slope integrating type ADC with necessary diagrams. Why is the output of quad slope ADC more accurate than that of dual slope ADC? [5+2]
6. List out the practical characteristics of instrumentation amplifier. What are the advantages of 3 op-amp instrumentation amplifier over one op-amp and two op-amp instrumentation amplifiers? Explain the operation of optically coupled isolation amplifier. [2+2+3]
7. For the circuit shown in figure below, find the expression for the output voltage (V_o). [4]



8. How can you find the RMS value of a sinusoidal signal using log and antilog amplifiers? Explain with necessary derivations and circuit diagrams. [7]

9. Describe the operation of thyistor using two transistor models and illustrate its characteristic curve for differing gate current values. [4+3]

10. What are choppers? Explain the working principle of single phase, full bridge inverter with necessary circuits and waveforms. [2+5]

11. The Buck-Boost regulator has input voltage Vs = 15V, duty cycle K = 40% and switching frequency of 20 KHz. The inductance L = 120 μH, filter capacitance, C = 200 μF and average load current Ia = 1.25 A. Determine (i) the average output voltage (ii) peak to peak output ripple voltage and (iii) peak to peak output ripple current. [2+2+3]

12. What is the advantage of BJT log amplifier over diode log amplifier? List out the applications of log-antilog amplifier. [1+2]

13. Explain the principle of biasing circuit in IC design. [3]

***

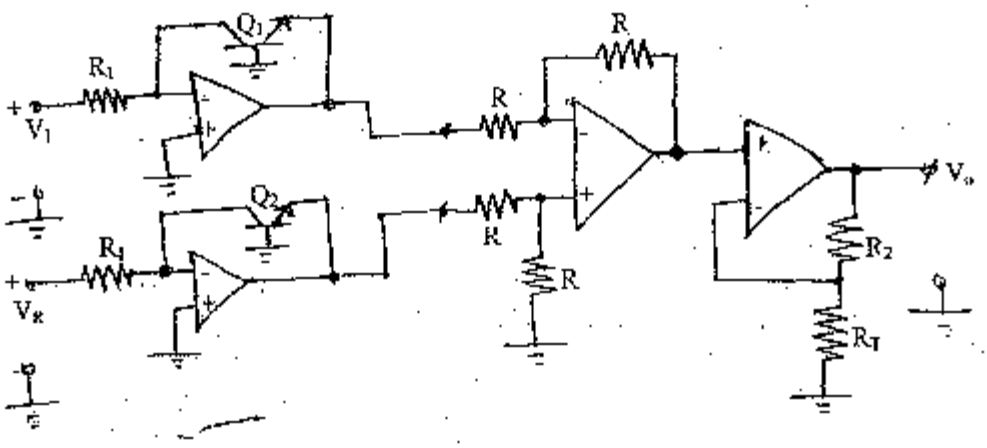
35 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Advanced Electronics *(EX 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What are the essential conditions for a current mirror to work? Derive an expression for an output resistance of Widlar Current Source. [2+5]
2. Define Slew Rate of an operational amplifier. An amplifier has a bandwidth of 20KHz and closed loop gain of 20. Find the maximum peak input signal that can be applied to obtain undistorted sine wave output. Assume SR = 1V/μs. [2+5]
3. Explain the effect of positive and negative input bias current on output voltage of an op-amp and suggest methods of reduction. [7]
4. Derive the expression for output voltage in inverted R-2R ladder type Digital to Analog Converter (DAC). What are the advantages of R-2R type DAC? [5+2]
5. Explain the operation principle of count up/down and tracking type ADC with necessary diagram. [7]
6. Find the expression for output voltage of three op-amp instrumentation amplifier. Also, explain how it rejects common mode signal. [5+2]
7. Find expression of output voltage for the circuit shown in figure below. (Q_1 and Q_2 are matched transistors). [4]



8. Design a circuit that produces output voltage $V_o = \left(\frac{V_x}{V_y}\right)^{\alpha} . V_z$ using Log and Antilog amplifiers, where $\alpha>1$ and V_x, V_y and V_z are analog input voltages. (Hint: $\ln(x^n) = n \ln(x)$) [7]

9. The gate current in a SCR half wave rectifier is adjusted to 1.25mA and the forward break-down voltage of SCR corresponding to this gate current is 110V. The applied voltage is 220V, the load resistance is 150Ω and holding current is zero. Determine: [2+1+2+2]
   a) Firing angle
   b) Conduction angle
   c) Average output voltage
   d) Average current

10. Classify chopper. Explain principle of step-down chopper with RL load. [2+5]

11. Explain the working principle of Boost Regulator with necessary circuit and expressions. [7]

12. Write short notes on: [3+3]
   a) Differential Amplifier
   b) Applications of log-antilog amplifier.

***

36 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Computer Organization Architecture *(CT603)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What are the major differences between computer architecture and computer organization? What does the width of data bus and address bus represent in a system? Why is bus hierarchy required? [2+2+2]
2. Explain the general organization of register in CPU. Describe the operation of LD (load) instruction under various addressing modes with syntax. [6+4]
3. What are the different types of instructions? How can you perform X = (A+B) × (C+D) operation by using zero, one, two and three address instruction format. Assume A, B, C, D, X are memory address. [3+5]
4. What is address sequencing? Explain the selection of address for control memory with its block diagram. [3+7]
5. Explain the Arithmetic pipeline and instruction pipeline with example. [10]
6. Draw the flowchart for floating point Division. [4]
7. Design a booth multiplication algorithm hardware. Multiply 5 and -6 using booth multiplication algorithm. [4+4]
8. Explain cache organization. Explain the cache mapping techniques with example. [4+6]
9. Highlight the role of I/O interface in a computer system. Describe the drawbacks of programmed I/O and interrupt driven I/O and explain how DMA overcomes their drawbacks. [4+6]
10. How can multiprocessor be classified according to their memory organization? Explain. [4]

***

01 /10

36 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Computer Organization and Architecture *(CT603)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Explain the interconnection of CPU with Memory and I/O devices along with different operations over them. [3+3]
2. Write down the Y = A/B+(C×D) + F(H/G) equation in three address, two address, one address and zero address instruction. [8]
3. Mention the different types of addressing modes. Compare each of them with algorithm as well as advantages and disadvantages. [10]
4. Differentiate between hardwired and micro-programmed control unit. How does a sequencing logic work in micro-programmed control unit to execute a micro-program? [4+6]
5. Explain the arithmetic pipeline and instruction pipeline with example. [10]
6. Explain the non-restoring division along with its algorithm, flowchart and example. [8]
7. Explain the Booth algorithm and multiply Y = 8×9 using Booth algorithms. [6]
8. Mention the characteristics of computer memory. Differentiate between associative mappings and set associative mapping with example. [3+5]
9. How does DMA overcome the problems of programmed I/O and interrupt-driven I/O techniques? Explain. [5]
10. Why IOP is use in I/O organization? Explain. [5]
11. Explain the characteristics of multiprocessors. [4]

***

37 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Ashad

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Computer Organization and Architecture *(CT603)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What is performance balance and why is it required? Explain different elements of bus design. [6]
2. Define the addressing mode and explain the different types of addressing modes with example. [10]
3. What are the stages of ALU design? Explain with the example of 2-bit ALU performing addition, subtraction, OR and XOR. [8]
4. What are the differences between hardwired implementation and micro-programmed implementation of control unit? Explain with steps involved when you are designing micro-program control unit. [4+6]
5. What is instruction hazard in pipeline? What is the four segment instruction pipeline? Explain with example. [2+8]
6. How division operation can be performed? Explain with its hardware implementation. [10]
7. Draw a flowchart of floating point subtraction. [4]
8. What are the major differences between different cache mapping techniques? Suppose main memory has 32 blocks and Cache memory has 8 blocks when 10 blocks of main memory are used, show how mapping is performed in direct mapping technique. [6+2]
9. Differentiate between programmed I/O, interrupt-driven I/O and direct memory access (DMA). [10]
10. Explain the interprocessor synchronization with example. [4]

***

36 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: -Computer Organization and Architecture ***(CT 603)***

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Explain the functional view and four types of operations used in computer. [6]
2. What are most common fields in an instruction? How can you perform X=(E+F)*(G+H) operation by using zero, one, two and three address instruction format. Assume that E, F, G, H and X are memory addresses. [8]
3. Define addressing mode. Explain different types of addressing modes with example. [10]
4. Explain various fields in micro-instruction format with neat and clean block diagram. Describe how address of control memory is selected. [3+7]
5. What are the hazards in instruction pipelining? How can they be resolved? Explain. [10]
6. Explain Booth algorithm. Use the Booth algorithm to multiply 23(multiplicand) by -21(multiplier), where each number is represented using 6 bits. [8]
7. Explain floating point division algorithm. [6]
8. Explain cache read operation. What are the demerits of direct mapping technique used in cache design and describe in details any one of the mapping technique that solves these problems. [8]
9. Why input-output processor is needed in an input-output organization? Explain with block diagram. [10]
10. Define the multiprocessor and its characteristics. [4]

***

36 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Computer Organization and Architecture *(CT603)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Explain the interconnection of CPU with Memory and I/O devices along with different operations over them. [3+3]
2. Write down the Y = A/B+(C×D) + F(H/G) equation in three address, two address, one address and zero address instruction. [8]
3. Mention the different types of addressing modes. Compare each of them with algorithm as well as advantages and disadvantages. [10]
4. Differentiate between hardwired and micro-programmed control unit. How does a sequencing logic work in micro-programmed control unit to execute a micro-program? [4+6]
5. Explain the arithmetic pipeline and instruction pipeline with example. [10]
6. Explain the non-restoring division along with its algorithm, flowchart and example. [8]
7. Explain the Booth algorithm and multiply Y = 8×9 using Booth algorithms. [6]
8. Mention the characteristics of computer memory. Differentiate between associative mappings and set associative mapping with example. [3+5]
9. How does DMA overcome the problems of programmed I/O and interrupt-driven I/O techniques? Explain. [5]
10. Why IOP is use in I/O organization? Explain. [5]
11. Explain the characteristics of multiprocessors. [4]

***

25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2067 Ashadh

Exam.		Regular/Back	
Level	BE	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Architecture

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What is computer architecture? Explain RTL and its use in computer architecture design. [3+5]
2. Mention the different types of addressing modes and compare each of them. [10]
3. Which of the cache mapping techniques require cache replacement algorithm and why? Explain different cache replacement algorithms used. [3+5]
4. Explain the term "Instruction set completeness". What are the things to be taken into consideration while designing an instruction set for a computer? [5+5]
5. What is interrupt? How are multiple interrupts recognised/prioritized when there are far lesser number of INTR pins in CPU than the number of interrupting devices [2+6]
6. Why does a computer system require virtual memory? Design a paging system with 32KB of virtual address space ad 16 KB of physical address space. Assume size of the page as 4KB. Also illustrate how logical address is converted into physical address. [1+4+5]
7. What are the properties of RISC? Explain the importance of register window and its use in RISC compilers. [4+4]
8. What do you mean by scheduling? Explain the importance and use of virtual memory by OS. [4+6]
9. Write short notes on: [5+5]
   a) Wilke's controller
   b) Process control block

***

24. TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2066 Bhadra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Architecture

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What do you mean by Computer Architecture? Why is its study important? [3+4]
2. What is bus? Explain its design. Why is bus necessary in computer design? [2+3+3]
3. Draw an ALU component which performs addition, substraction, increment and decrement operation with necessary circuit and explain the logic used. [8]
4. What is memory hierarchy? Why is memory hierarchy required in a computer? [4+4]
5. Differentiate between L1 and L2 cache. Explain the write policy used in cache memory. [2+6]
6. How does a processor handle interrupt? Explain interrupt driven input/output. [4+4]
7. Explain different addressing modes used by computer instructions. [7]
8. What is pipelining? How does it improve the performance of a computer? [3+5]
9. Why is operating system required? How does OS handle memory management? [3+5]
10. Write short notes on: [5+5]
    a) RISC vs CISC
    b) DMA

***

24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2066 Poush

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Architecture

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt All questions.*
- ✓ *The figures in the margin indicate Full Marks.*
- ✓ *Assume suitable data if necessary.*

1. Explain how instruction pipelining improves performance of a CPU? What are the hazards of instruction pipelining? Suggest how such hazards can be overcome. [5+2+3]
2. Why CISC processors are dominating the market? Explain with sketch overlapped register windows with 3 procedures for a processor with 8 windows each with 8 global, 8 local and 16 overlapped registers. Total number of registers in the CPU is 136. [3+7]
3. Prepare a design guidelines for designing a computer with 16 bits data and 12 bits address. Show register organization, bits, op code design for register reference, memory reference (direct/indirect) and IO reference. How many instructions will be there in instruction set for this computer? Also write micro operations for op code fetch and decode stage. [3+2+3+2]
4. What are the characteristics of typical DSP algorithms? Explain architecture of DSP application. [5+5]
5. Explain memory hierarchy used in computer in terms of access time, cost per byte and size of the memory device. Define cache hit and cache miss. How cache miss is handled? Explain. [4+2+4]
6. Define race condition. The use of sleep and wakeup primitives in producer consumer problem can not avoid race condition, explain. How semaphore solves the race condition? [2+4+4]
7. Memory manager is an important part of OS, why? Design a paging system with 64 KB of virtual address space and 32 KB of physical address space. Assume size of the page yourself. Also illustrate how logical address is converted into physical address. [1+4+5]
8. Write short notes (any two) [2×5]
   a) Wilkes Controller
   b) Microinstruction Sequencing
   c) Virtual Memory Performance

***

24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2065 Kartik

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Architecture

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. How the performance of the Bus is limited in computer? What are different types of bus hierarchy? Explain the mezzanine bus architecture? [3+5]
2. Explain the direct mapping techniques? What are advantage and disadvantage of the direct memory mapping technique? [6+2]
3. Write short notes on instruction format that includes instruction length, allocation of bits, variable length instruction. [8]
4. Why memory management is required in computer? Describe different techniques for managing memory performed by OS. [2+6]
5. Describe how hardwire control unit is implemented using necessary block diagram. What do you mean by control unit logic? [6+2]
6. Explain different types of register found in processor and design issues concern with them? [6+2]
7. What is pipelining? Explain in detail six stage pipelining, how the performance of the computer increase. [2+6]
8. Explain RISC and CISC architecture and explain the pros and cons related to architecture. [4+4]
9. What is the variable partition memory management? Why relocation feature is required for the implementation of variable partition memory management? Why protection is to be enforced on these systems? [2+4+2]
10. Write short notes (any two) [4+4]
    a) Line replacement algorithm
    b) Macroinstruction and microperation
    c) Segmentation

***

24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2065 Shrawan

Exam.	Regular/Back		
Level	BE	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Architecture

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Write the block diagram of system architecture? What are the factors that limit the bus performance and define the way to avoid this bottleneck? [2+6]
2. What are the requirements of memory in computer? Do memory hierarchy satisfies the need of memory requirement, if yes how? [2+6]
3. Compare the advantage and disadvantage of implementing direct and associative memory mapping techniques. Suppose a computer using fully associate cache has 216 words of main memory and a cache of 64 blocks, where each cache block contains 32 words. [4+4]
   a) How many block of main memory are there?
   b) What is the format of a memory address as seen by the cache, that is, what are the sizes of the tag and word fields?
   c) To which cache block will the memory reference F8C916 map?
4. Describe the instruction cycle state diagram? Classify the instruction according to the number of addresses with a suitable example. [4+4]
5. What are the types and requirement of various addressing modes? Explain about the different types of displacement addressing modes. [2+6]
6. Explain different types of register found in processor and design issues concern with them. [8]
7. What is the functional requirement of the control unit? Explain the key element and function of the micro program control unit with block diagram. [2+6]
8. Explain different types of operating system? Why scheduling is required in OS and explain different types of scheduling technique? [3+5]
9. What does the Amdahl's law tell us about performance optimization? The processes spend 70% of their time running in the CPU and 30% waiting for service from the disk. Suppose processor array upgrade is 50% faster than what you have and costs $10,000. Similarly there is a set of disk drives for $7,000 which promises two and a half times the throughout of your existing disks. Then in economical view whether processor or disk is to choose for your computer? [3+5]
10. Write short notes (any two) [4+4]
    a) Bus Arbitration
    b) Write Policy
    c) Functional view of Computer History

***

24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2064 Jestha

Exam.	Regular/Back		
Level	BE	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Architecture

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What do you understand by instruction sets? What are the elements of an instruction? Explain it. [2+4]
2. Explain the different types of shift and rotate operations with suitable diagrams. [6]
3. Define effective address. Explain direct and indirect addressing modes and compare them with a suitable example. [2+4]
4. What do you understand by stack organization? What are the microoperations involved in PUSH and POP operations in a register stack. [2+4]
5. Why do we use cache memory? Draw the flowchart for cache read operation. [2+4]
6. Draw a neat diagram for the general model of control unit. What are the inputs and outputs associated with it? Explain in brief. [2+4]
7. What is pipelining? How do you say that pipelining makes the CPU fast? [3+4]
8. A computer system needs 512 bytes of RAM and 512 bytes of ROM. The RAM and ROM chips of having 128×8 and 512×8 memory locations respectively. How will you design the RAM and ROM chips with 16 bit address bus CPU? [10]
9. How memory management unit find out that the particular virtual address is mapped to the particular page frame in real memory? [6]
10. Consider computer A with 600 MHz clock requires 5 second to run a program. We are required to design computer B that will only take 4 seconds to run this program. It is found that an increase in clock rate will cause machine B to require 1.1 times clock cycles as A for same program. What should be the clock rate of computer B? [6]
11. Write short notes on any three: [3×5]
    a) Booth's Algorithm
    b) Reverse Polish Notation
    c) Characteristics of CISC
    d) Overlapped Register Windows

***

24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2064 Kartik

Exam.		Back	
Level	BE	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Architecture

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What is instruction cycle? Draw the instruction cycle state diagram with interrupt. [2+4]
2. Draw the flowchart for Booth's algorithm. [6]
3. What is an implied addressing mode? Explain register direct and register indirect addressing modes with suitable diagrams. [2+4]
4. Draw the simplified view of a processor organization. What are the operations performed in CPU? Explain them in brief. [2+4]
5. What is memory hierarchy? What are the characteristics of a memory system? Explain it. [2+4]
6. What do you understand by microprogrammed control unit? Explain the organization of a control memory. How microprogrammed control unit is implemented? [2+4+2]
7. What are the five clock cycles used for the implementation of pipelining in DLX instruction set. [5]
8. A computer system needs 512 bytes of RAM and 1024 bytes of ROM. The RAM and ROM chips of having 128×8 and 512×8 memory locations respectively. How will you design the RAM and ROM chips with 16 bit-address bus CPU? [10]
9. Define overlays. Explain the basic concepts of Virtual Memory? [2+4]
10. The average number of cycles per instruction (CPI) for different class of instruction are as shown below. [2+2+2]

Instruction class	CPI
A	1
B	2
C	3

For a particular high level language statement, the compiler is considering two code sequences that require the following instruction counts.

Code Sequence	Instruction count for instruction class		
	A	B	C
1	2	1	2
2	4	1	1

Calculate the following:

a) Which code sequence executes the most instructions?
b) Which will be faster?
c) What is the CPI for each code sequence?

11. Write short notes on any three: [3×5]

a) RISC Architecture
b) Horizontal and Vertical Microinstruction
c) Process State and Transition
d) Pipeline Hazards

***

24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2063 Baishakh

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Architecture

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What is ISA? Write an explanatory note on ISA. [1+ 5]
2. Is it easy to measure computet performance? What are the indicators? Explain. [6]
3. Within memory everything is just the stream of bits, then how does a processor make the distinction between the data and the code. Explain with a sample small program and its execution. [6]
4. Why instructions are grouped into various types? How does the instruction typing augment in designing the better architecture? Explain. [6]
5. Explain at least five different addressing modes with diagramatic illustrations. [6]
6. Why RISC machine is considered as faster than CISC? What are the reasons that kept CISC in market? Explain. [2 + 4]
7. Are registers mandatory in computer design? Explain the register organization for any processing system with their types and uses. [6]
8. What is microinstruction? Why their expansion is associated with horizontal or vertical? Explain. [6]
9. What is pipelining? Is the pipelining depth and processing decomposition related? Explain. [6]
10. Present a concise but explanatory note on complete steps of control unit design, assuming all specifications on your own. [6]
11. Compare the followings: [2.5*4]
    i) Memory Buffer Register (MBR) versus Instruction Buffer Register (IBR)
    ii) Interrupt versus Trap
    iii) Seek time versus Access time in disk performance parameters
    iv) Mono-programming versus Multi-programming
12. Write short notes on the followings: [2.5*4]
    a) DMA
    b) Virtual Machine
    c) Set Associative Mapping
    d) Programmed IO

24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2063 Ashwin

Exam.		Back	
Level	BE	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Architecture

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. In any computer system, there are various IO devices working simultaneously. How does the single processor manage and handle the exact data related to that particular IO device only (not mixing each other)? Explain. [6]
2. What is the function of program counter (PC)? What does it count, if a system is running a C program, numbers of semi-colon signs in program or the total characters in program or the number of data bits or anything else explain in detail. [6]
3. Though concurrent parallel processing enhances the performances drastically of any computer system, the achievement is not so easy. What are the issues to be taken care of? Explain with sample problematic scenario. [6]
4. What is RISC? Explain its working principle and mention the advantages and disadvantages. [6]
5. What is instruction pipelining? How to deal with branch and jump? Explain. [6]
6. What is virtual memory? Explain whole working and management of virtual memory in any system. [6]
7. What do you understand by multiple address (operand) instruction formats? What are their types? What are the advantages/disadvantages of their use? Explain with example. [6]
8. Classify the different types of registers with their use in processing. [6]
9. What are the major issues on instruction set design? Explain in detail. [6]
10. What is datapath? Present a clear explanation using your own simple system architecture diagram (assume all specifications on your own). [6]
11. Compare the followings: [2.5×4]
    a) Spatial locality versus temporal locality
    b) Instruction count versus clock cycle
    c) Carry flag versus overflow flag and their use
    d) Micro-instruction versus macro-instruction
12. Write short notes on the followings: [2.5×4]
    a) Register Transfer Language (RTL)
    b) Cache Lines
    c) Wilkes Controller
    d) OS Kernel

***

24/1-26 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2062 Baishakh

Exam.	Regular/Back		
Level	B.E.	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Architecture

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Draw a whole instruction cycle activity using a simple state diagram, with brief explanation. (6)
2. What are the prime principles for instruction set design? Explain in detail. (6)
3. Why there is need of microprogramming for processor implementation? Is there any other way to achieve it? Explain. (6)
4. DMA provides the better performance in comparison to both interrupt driven and programmed IO, still faces the charge of cycle stealing? Why is it so? Explain. (6)
5. What is operand? What types of operands are typical in machine instruction set design? (6)
6. How many types of operating systems are there? What are they? Explain. (6)
7. Briefly discuss various real memory management techniques with their merits comparision. (6)
8. What do you understand by multi-programming? How does it improve the performance? Explain. (6)
9. What is the difference between big endian and little endian? Clarify with example. (6)
10. Explain the register organization requirement for any processing system with their types and uses. (6)
11. Prepare a clear, illustrative class note on a simple CPU design. Assume everything on your own. You just need to cover on (10)
    a. simple CPU specification,
    b. required registers and datapath
    c. instruction execution steps with RTL (control unit not required)
12. Write short notes on the followings (4 * 2.5)
    (a) Program Counter(PC)
    (b) Set associative mapping
    (c) Worse fit algorithm
    (d) Translation Lookaside Buffer (TLB)

24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2062 Kartik

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Computer Architecture

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. In addition to fetch and execution cycle, there is also optional indirect cycle. Explain it with all micro-operations and sequences. (6)
2. Differentiate between macroinstruction and microinstruction, with illustrative example. (6)
3. Classify the different types of registers with their use in processing. (6)
4. CISC machine maintains various modes of addressing. What are they? Explain with comparative reasons of their existence. (6)
5. When a device interrupt occurs, how does the processor determine which device issued the interrupt, and how does it service? Explain. (6)
6. What is operating system? How does it relate with computer architecture? Write a brief note. (6)
7. How is a horizontal microinstruction interpreted? Explain with instruction and diagram. (6)
8. What is virtual memory management? What are the types? How it is managed? Explain. (6)
9. Though asynchronous concurrent processing tremendously enhances the system performance, complexity and problems are associated with it. What are the problems? Explain briefly with examples. (6)
10. What is pipelining? What is pipeline depth? What are the hazards associated with it? (6)
11. Prepare a clear, illustrative class note on a simple Control Unit design using micro-sequencing (not hardwired). Assume everything on your own. (10)
12. Write short notes on the followings (4 * 2.5)
    a. Relocatable translation and loading
    b. Process Control Block (PCB)
    c. Clock cycles grouping rule in micro-operation
    d. Fully-associative mapping