

KANTIPUR ENGINEERING COLLEGE
Dhapakhel, Lalitpur
Model Entrance Test (2074)

Solution Set: III (B)

Section I

- | | | | | |
|---------|---------|---------|---------|---------|
| 1. (D) | 2. (B) | 3. (C) | 4. (A) | 5. (A) |
| 6. (B) | 7. (C) | 8. (D) | 9. (B) | 10. (D) |
| 11. (A) | 12. (C) | 13. (C) | 14. (A) | 15. (B) |

16. (D)

Hint: $2 \cos^2 x + 2 \sin x \cdot \cos x - \sin x \cdot \cos x - \sin x$
 $(\cos x + \sin x)(2 \cos x - \sin x) = 0$
 Tan x = -1, tan x = 2 (imp)

$$x = n\pi - \frac{\pi}{4}$$

17. (A)

18. (A) Hint: Point of intersection : (3, 11)

$$m = \tan \theta = \infty$$

line 11 to y - axis

19. (C) **Solution:** $D = \sqrt{(x_2 - m)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2} = \sqrt{6^2 + 2^2 + 3^2} = 7$

20. (C)

21. (D)

22. (D)

Solution: $\lim_{x \rightarrow \infty} \frac{\tan 1/x}{1/x} = \lim_{y \rightarrow 0} \frac{\tan y}{y} = 1$

- | | | | | |
|---------|---------|---------|---------|---------|
| 23. (B) | 24. (D) | 25. (D) | 26. (B) | 27. (C) |
| 28. (A) | 29. (B) | 30. (A) | 31. (D) | 32. (A) |
| 33. (A) | 34. (A) | 35. (C) | 36. (C) | 37. (C) |
| 38. (B) | 39. (B) | 40. (B) | 41. (B) | 42. (A) |
| 43. (C) | 44. (D) | 45. (D) | 46. (A) | 47. (C) |
| 48. (B) | 49. (B) | | | |
| 50. (D) | | | | |

Solution: Mass of one mole of Methane (CH₄) = 16 g

Mass of 0.1 mole methane 16 × 0.1 g = 1.6 g

51. (C)

Solution: $\text{pH} = -\log [\text{H}^+]$

$$[\text{H}^+] = 0.0001 = 1 \times 10^{-4}$$

$$\text{pH} = -\log [1.0 \times 10^{-4}] = 4$$

52. (A)

53. (D)

54. (B)

55. (A)

56. (C)

Solution:

Let O.N. of Cl be x

$$x + 3(-2) = -1$$

$$\text{or } x - 6 = -1$$

$$\text{or } x = 6 - 1 = 5$$

57. (C)

58. (B)

59. (D)

60. (A)

Section II

61. (B)

62. (B)

63. (C)

Hint: Domain : $4 - x^2 \geq 0$

Range : [Min, Max] = [0, 2]

64. (A) **Solution:**

$$x^2 - 3x - 7 = 0$$

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc} \Rightarrow c^2 - 3c - 7 = 0$$

65. (B) Hint: $|\vec{a} + \vec{b} + \vec{c}|^2 = (\vec{a} + \vec{b} + \vec{c}) \cdot (\vec{a} + \vec{b} + \vec{c})$

66. (D)

67. (A) Hint:

$$r^2 = h^2 + l^2$$

$$r = k \Rightarrow h^2 + l^2 = k^2, (h, k) \rightarrow \text{centre}$$

68. (C)

Hint: $y^2 = \frac{4}{5}x$

$$a = \frac{1}{5}$$

Directrix : $x = -a$

69. (A) **Solution:** Plane through (4, 0, 0) and (0,0,3) parallel to y – axis.

70. (A)

71. (C)

72. (B) Hint: $(w)^{3n} + (w^2)^{3n} = (w^3)^n + (w^3)^{2n}$

73. (C)

74. (B) Hint: $y = -\left[-x - \frac{x^2}{2} - \frac{x^3}{3} \dots\right] = -\log_e(1-x)$

75. (D) Hint: $I = \int_0^{\pi/2} \frac{\sin(\pi/2 - x)}{\sin(\pi/2 - x) + \cos(\pi/2 - x)} dx = \int_0^{\pi/2} \frac{\cos x}{\cos x + \sin x} dx$

76. (D) Hint: $V = \frac{4}{3}\pi r^3$, $\frac{dv}{dr} = 4\pi r^2$, $\frac{dv}{ds} = \frac{r}{2}$

$$S = 4\pi r^2, \frac{ds}{dr} = 8\pi r$$

77. (D) Hint: $A = 2 \int_0^a y dx$

78. (C)

79. (C)

80. (B)

81. (B)

82. (D)

Solution:

$$F = a + bt^2$$

$$[a] = [F] | [E] = [MLT^{-2}] / [T] = [MIT^{-3}]$$

$$[b] = [F] | [t^2] = [MLT^{-2}] / [T^{-2}] = [MLT^{-4}]$$

83. (C) **Solution:**

$$y = 12x - \frac{3}{4}x^2$$

$$\text{At } x = R_1, y = 0$$

$$0 = 12R - \frac{3}{4}R^2 \Rightarrow R = 16 \text{ m}$$

84. (A)

Solution:

$$\text{Initial momentum} = P_1 = p$$

$$\text{Final momentum} = P_2 = P + p \times 0.5 = 1.5 p$$

$$\text{Kinetic energy } K = \frac{p^2}{2m} \propto p^2$$

$$\frac{k_2}{k_1} = \left(\frac{p_2}{p_1}\right)^2 \Rightarrow \frac{k_2}{k_1} - 1 = \left(\frac{p_2}{p_1}\right)^2 - 1$$

$$\frac{k_2 - k_1}{k_1} = (1.5)^2 - 1$$

$$\Delta k \% = (2.25 - 1) \times 100\% = 125 \%$$

85. (A)

Solution:

Time taken by stone to fall down,

$$t_1 \sqrt{2h/g} = \sqrt{2 \times 500/10} = 10 \text{ sec}$$

Time taken by sound to travel 500 m distance is

$$t_2 = \frac{4}{9} = \frac{500}{332} = 1.5 \text{ sec}$$

$$\therefore t = 10 + 1.5 = 11.5 \text{ sec}$$

86. (D)

Solution:

$$l_{20} = 1 \text{ km}$$

$$l_{10} = l_{20} (1 + \alpha \Delta \theta) = 1(1 + \alpha 10)$$

$$= 0.99988 \text{ km distance will have reading 1 km}$$

$$1 \text{ km distance will have reading } \frac{1}{0.99988} \text{ km} = 1.00012 \text{ km}$$

87. (B) **Solution:** $R.H. = \frac{P}{p} \times 100\%$ given $p = p$

$$\therefore RH = 100\%$$

88. (C) **Solution:** $E = - \frac{dv}{dx} \Big|_{atx1} = -20v/m$

89. (D)

90. (D)

Solution:

$$R \propto \frac{l}{A} \Rightarrow \frac{\Delta R}{R} = \frac{\Delta l}{l} + \frac{\Delta A}{A}$$

Since the volume of the wire is constant, so increasing the length by 10% leads to reduction in area by 10%

$$\frac{\Delta R}{R} = 0.1 + 0.1$$

$$\Delta R = 0.2 \times R = 2\Omega$$

$$\therefore R_f = R_1 + R = 10 + 2 = 12 \Omega$$

91. (B) **Solution:** $F = B il \sin \theta = 1.2 \text{ N}$

92. (B)

Solution:

$$\frac{V_s}{V_p} = \frac{I_p}{I_s} = \frac{N_s}{N_p} = \frac{25}{1}$$

$$\therefore I_p \cdot 25 I_s = 50A$$

93. (B) Hint: $\mu = \frac{\text{real depth}}{\text{apparent depth}}$

94. (A) Hint: $\frac{a_1}{a_2} = \sqrt{\frac{I_1}{I_2}}$

95. (C)

Solution:

The ratio of left mass to original mass = $\frac{1}{6} = \left(\frac{1}{2}\right)^4$

$$\left(\frac{1}{2}\right)^4 = \left(\frac{1}{2}\right)^{t/T} \Rightarrow t = 4T$$

\therefore Half life of the substance is $T = t/4$

Hence, $t = 120$ days

$$\therefore T = \frac{120}{4} = 30 \text{ days}$$

96. (A)

Solution: $En = \frac{13.6}{n^2} = \frac{13.6}{100} = 0.136 \text{ eV}$

97. (D)

Solution: Molecular weight of $(\text{COOH})_2 \cdot 2\text{H}_2\text{O} = 126$

$$\text{Equivalent weight} = \frac{\text{Molecular weight}}{2} = \frac{126}{2} = 63 \text{ [Because basicity} = 2\text{]}$$

Weight of $(\text{COOH})_2 \cdot 2\text{H}_2\text{O}$ in solution = 32.5 g

$$\text{Normality} = \frac{\text{No. of gram equivalent wt.}}{\text{Volume (in L)}} = \frac{32.5/63}{0.5} = 1.03 \text{ N} = 1.0 \text{ N}$$

98. (B)

Solution:

$$\frac{\text{Wt. of copper}}{\text{Wt. of iodine}} = \frac{\text{Eqvt. wt. of copper}}{\text{Eqvt. wt. of iodine}} \quad \text{Let } x \text{ be the weight of iodine deposited}$$

$$\frac{1.25}{x} = \frac{31.7}{127} \quad \text{or } x \cdot 31.7 = 1.25 \times 127 \quad \text{or } x = \frac{158.75}{31.75} \quad \text{or } x = 5.0 \text{ g}$$

99. (C)

100. (A)