Answer-key & Solution

SSC JE (Basic Electronics)
Date 19.08.2017

1. A	13. C	25. C	37. C	49. A	61. A	73. B	85. D
2. C	14. B	26. B	38. B	50. B	62. B	74. B	86. D
3. A	15. C	27. B	39. B	51. C	63. C	75. B	87. C
4. A	16. A	28. A	40. D	52. B	64. D	76. D	88. D
5. D	17. A	29. B	41. C	53. B	65. C	77. B	89. C
6. B	18. A	30. A	42. D	54. C	66. D	78. D	90. B
7. C	19. C	31. B	43. A	55. C	67. B	79. A	
8. B	20. C	32. A	44. C	56. C	68. A	80. C	
9. D	21. C	33. C	45. D	57. A	69. C	81. A	
10. C	22. A	34. B	46. A	58. B	70. C	82. B	
11. A	23. C	35. B	47. B	59. D	71. A	83. D	
12. B	24. D	36. D	48. D	60. B	72. A	84. A	

Note : *If your opinion differ regarding any answer, please message the mock test and Question number to 9560620353*

Note : *If you face any problem regarding result or marks scored, please contact : 9313111777*

SOLUTION

2. (C) Given : $n_i = 1.5 \times 10^{10} / cm^3$

$N_D = 2.25 \times 10^{15} \approx n$

$$P_n = \frac{n_i^2}{N_D} = \frac{(1.5 \times 10^{10})^2}{2.255 \times 10^{15}}$$

$= 1 \times 10^5 / cm^3 \approx p$

12. (B) Dynamics resistance of a diode varies as

$$\gamma_f = \frac{nV_T}{I}$$

i.e. $\gamma_f \propto \frac{1}{I}$

or γ_f varies as I^{-1}

13. (C) p-type semiconductor as a whole electrically neutral

14. (B) Given, $\in_r = 11.7$

$\in_o = 8.85 \times 10^{-12} F/m$

d = 10μm

We know that, $C = \frac{\in_o \in_r A}{d}$

or $\frac{C}{A} = \frac{\in_o \in_r}{d} = \frac{8.85 \times 10^{-12} \times 11.7}{10 \times 10^{-6}}$

$= 10.35$ μF ≈ μF

15. (C) We know that hall voltage is inversely proportional to the concentration i.e.,

$$V_H \propto \frac{1}{concentration}$$

Therefore $\frac{V_{H1}}{V_{H2}} \propto \frac{P_2}{P_1}$

or $V_{H2} = \frac{P_1}{P_2} \times V_{H1} = \frac{1}{2} V_{H1}$

Hence alternative (C) is the correct choice

17. (A) Given Eg_1 = 1eV, T_1 = 200 K, T_2 = 600K, Eg_2 = ?

$$\frac{Eg_1}{Eg_2} = \frac{T_2}{T_1}$$

Where Eg = Energy band gap

T = Temperature

Now, $Eg_2 = Eg_1 \times \frac{T_1}{T_2}$

$= 1eV \times \frac{200K}{600K} = \frac{1eV}{3}$

18. (A) Given, μn = 1500 cm^2/V-sec

V_T = 25.9 mV

D_n = ?

We know that $\frac{D_n}{\mu_n} = V_T$

Where, D_n = Diffusion constant

μn= Mobility of electron

V_T = Volt equivalent of temperature

Now, $D_n = \mu n\ V_T = 1500 \times 25.9 \times 10^{-3}$ cm^2/s = 38.85 cm^2/s or $D_n \approx 40$ cm^2/s

19. (C) Given $n_i = 1.48 \times 10^{10}$ cm^3

μ_n = 1300 cm^2/V – s

μ_p = 500 cm^2/V – s

ρ_i = ?

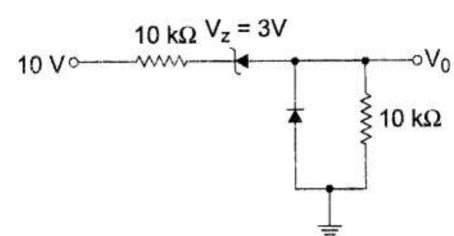
We know that, $\rho_i = \frac{1}{\sigma_i} = \frac{1}{qn_i(\mu_n + \mu_p)}$

or $\rho_i = \frac{1}{1.6 \times 10^{-19} \times 1.48 \times 10^{10} (1300 + 500)}$

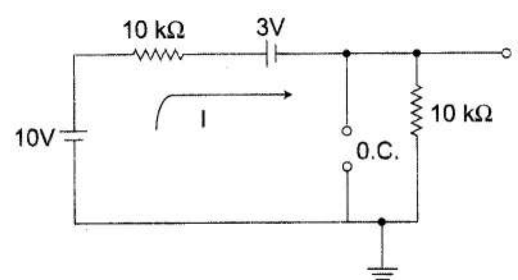
or $\rho_i = 2.35 \times 10^5 \Omega - cm$

Hence alternative (C) is the correct choice.

33. (C) The given Figure



The above figure can be redrawn as



From above figure

10 – K.l. –3 – 10 K.l. = 0

or $l = \frac{7}{20K} = \frac{7}{20} mA$

and $V_o = 10\,K.l. = 10K.\frac{7}{20} mA = 3.5V$

Hence alternative (C) is the correct choice.

45. (D) Given α = 0.9

$\therefore \quad \beta = \frac{\alpha}{1-\alpha} = \frac{0.9}{1-0.9} = 9$

47. (B) Given, α = 0.995, l_E = 10mA, l_{CO} = 0.5 μA, l_{CEO} = ?

We know that

$$l_{CEO} = (1+\beta) l_{CO} = \left(1 + \frac{\alpha}{1-\alpha}\right) l_{CO}$$

or $l_{CEO} = \left(1 + \frac{0.995}{1-0.995}\right) \times 0.5\mu A$

$= \frac{0.5\mu A}{0.005} = 100\mu A$

54. (C) Given, g_m = 1mA/V, Vp= –5V, V_{GS} = –3V, g_{mo} = ?

We know that $g_m = g_{mo}\left[1 - \frac{V_{GS}}{V_P}\right]$

Where, g_{mo} = maximum transconductance

$1 = g_{mo}\left[1 - \left(\frac{-3}{-5}\right)\right]$

or $1 = g_{mo}\left[\frac{5-3}{5}\right]$

or $g_{mo} = \frac{5}{2} = 2.5\, mA/V$

Hence alternative (D) is the correct choice.

60. (B) The movement of hole is brought about by the vacancy being filled by a valence electron from a neighbouring atom. Because hole is nothing but a vacancy creater by electron movement.

63. (C) $C_T = C_o\left(\frac{1}{\sqrt{V_B + V_T}}\right)$

or $C_T \propto |V_B + V_r|^{-1/2}$

64. (D) We know that diffusion capacitance C_D is given by relation

$$C_D = \frac{\tau . I}{\eta V_T}$$

Where, I is the forward current.

i.e. $C_D \propto I$

or $\frac{CD_1}{CD_2} = \frac{I_1}{I_2}$

$C_{D_2} = \frac{I_2 . C_{D_1}}{I_1} = \frac{4 \times 8\mu F}{1} 3.2\mu F$

69. (C) Given that $A_{VS} = \frac{V_o}{V_S} = 0.9, R_s = 3K, g_m = ?$

$$A_V = \frac{R_s}{R_s + \frac{1}{gm}}$$

$$0.9 = \frac{3k\Omega}{3k\Omega + \frac{1}{gm}}$$

or g_m = 3mA/V

Hence alternative (C) is the correct answer.

73. (B) $g_{mo} = \frac{2l_{DSS}}{|V_P|} = \frac{2 \times 1 \times 10^{-3}}{5} = 0.4$ milli mho.

74. (B) $f_{max} = \frac{\text{Slew rate}}{2\pi . V_m}$

$= \frac{0.5 \times 10^6}{2 \times \pi \times 2\sqrt{2}}$

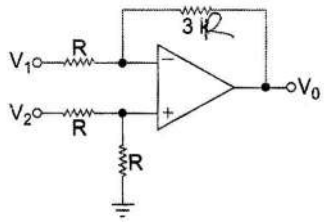
$\Rightarrow$ 28 KHz

75. (B) Given A = 100

$\beta = 10\% = \frac{10}{100} = 0.1$

$A_f = \frac{A}{1 + A\beta} = \frac{100}{1 + 100 \times 0.1} = \frac{100}{11} = 9.09$

78. (D) Output voltage due to inverting input i.e. V_1



$$V_{o1} = -V_1\left(\frac{3R}{R}\right)$$

or $V_{o1} = -3V_1$

and output voltage due to non-inverting input i.e. V_2

$$V_{o2} = V_A\left(1+\frac{3R}{R}\right)$$

or $$V_{o2} = \left(\frac{R}{R+R}V_2\right)(1+3) = 2V_2$$

so $V_o = -3V_1 + 2V_2$

86. (D) (i) FET has higher input impedance than BJT.

(ii) FET is a unipolar device. The current flow in FET is due to majority carriers as there are no minority carriers.

87. (C) At well below pinch- off condition the drain-to-source resistance is controlled by the bias voltage V_{gs}. Therefore, JFET can ben be used as a voltage variable resistor (VVR).

89. (C) $\alpha = 0.99$

$I_b = 20\ \mu A$

Collector current

$$I_C = \beta I_b = \frac{\alpha}{1-\alpha}I_b$$

$$I_C = \frac{0.99}{0.01}20\mu A$$

$I_C = 1.98$ mA

Emitter current

$I_e = I_c + I_b$

$= (1.98 + 0.02)$ mA = 2mA.