POSTAL Book Package 2023

Electrical Engineering

Objective Practice Sets

Analog Electronics

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MADE EASY Publications

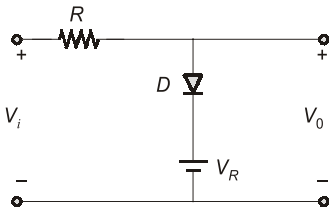
1 CHAPTER
Basics of Semiconductor Diodes

MCQ and NAT Questions

Q.1 A diode whose terminal characteristics are related as $i_D = I_s e^{V/V_T}$, where I_s is the reverse saturation current and V_T is thermal voltage (V_T = 25 mV), is biased at I_D = 4 mA. Its dynamic resistance is

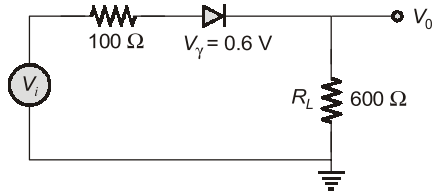
(a) 12.5 Ω (b) 50 Ω
(c) 6.25 Ω (d) 25 Ω

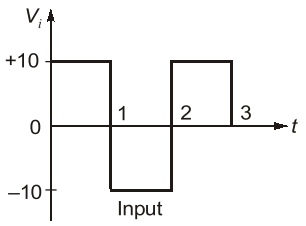
Q.2 In the circuit shown below the input V_i has positive and negative swings. V_o is the output.



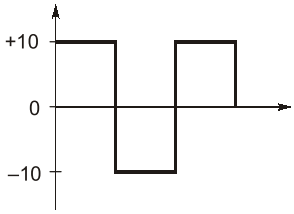
(a) $V_o = 0$ for negative V_i
(b) $V_o = V_R$ for positive V_i
(c) $V_o = V_R$ for $V_i > V_R$
(d) $V_o = V_R$ for all V_i

Q.3 In the circuit shown below, if the input voltage V_i is as shown below then the corresponding output waveform will be



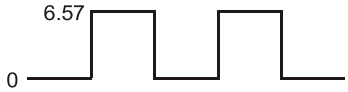


(a)



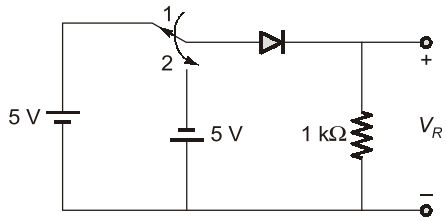
(b)

(c)



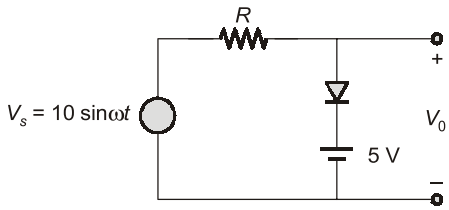
(d)

Q.4 In the circuit shown below, the switch was connected to position 1 at $t < 0$ and at $t = 0$, it is changed to position 2. Assume that the diode has zero voltage drop and a storage time t_s. For $0 < t \le t_s$, V_R is given by (all in Volts)

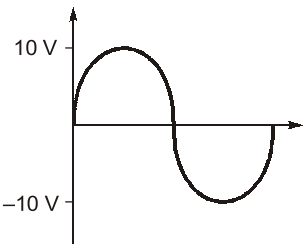


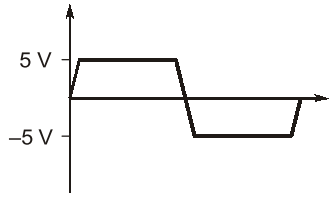
(a) $V_R = -5$ (b) $V_R = 0$
(c) $0 \le V_R < 5$ (d) $-5 < V_R < 0$

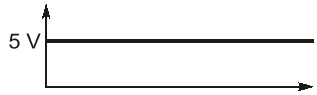
Q.5 For the circuit shown below assuming ideal diode, the output waveform V_0 is

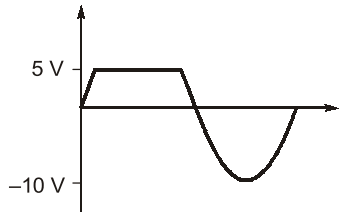


(a)

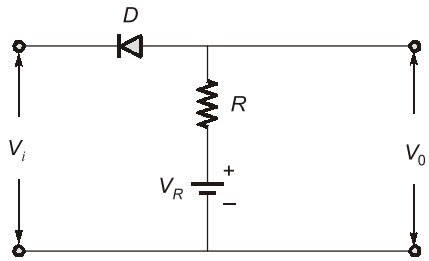


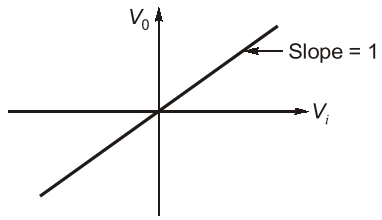
(b)


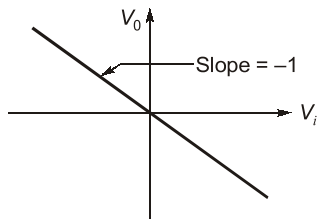
(c)


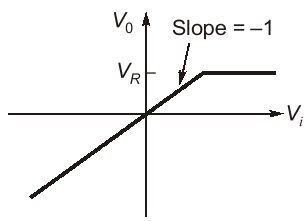
(d)


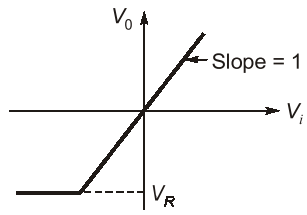
Q.6 The transfer characteristic of the network shown below is represented as



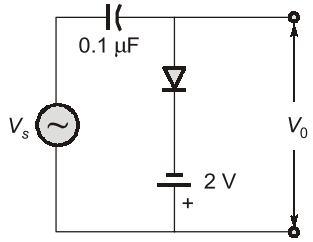
(a)


(b)


(c)


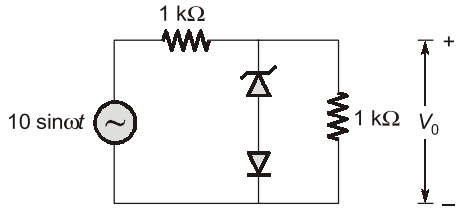
(d)


Q.7 For an input of $V_s = 5 \sin\omega t$, (assuming ideal diode), circuit shown below will behave as a



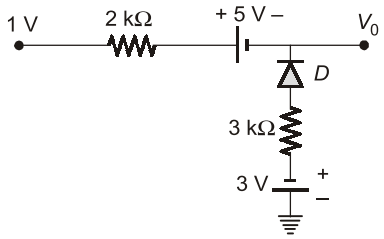
(a) clipper, sine wave clipped at –2 V
(b) clamper, sine wave clamped at –2 V
(c) clamper, sine wave clamped at zero volt
(d) clipper, sine wave clipped at 2 V

Q.8 The cut-in voltage of both zener diode D_z and D shown in figure is 0.65 V, while breakdown voltage of the zener is 3 V. Diode is considered to be ideal. The value of peak output voltage V_o.



(a) 3 V in the positive half cycle and 0.65 V in the negative half cycle.
(b) 3.65 V in the positive half cycle and –5 V in the negative half cycle.
(c) 3 V in positive half cycle and –5 V in the negative half cycle
(d) –3.65 V in positive half cycle and 5 V in the negative half cycle

Q.9 What is the output voltage V_0 for the circuit shown below assuming an ideal diode?

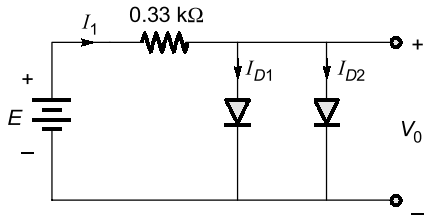


(a) $-\frac{18}{5}$ V
(b) $\frac{18}{5}$ V
(c) $-\frac{13}{5}$ V
(d) $\frac{13}{5}$ V

Q.10 The correct waveform for output (V_0) for below network is

Multiple Select Questions (MSQ)

Q.116 For the circuit shown below :

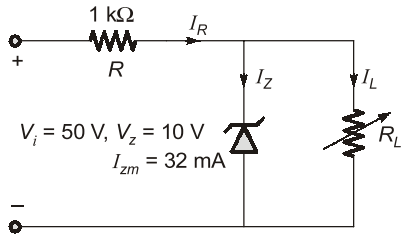


Which of the following statement is correct?

(a) $I_1 > I_{D1} > I_{D2}$ (b) $I_{D1} < I_{D2} < I_1$

(c) $I_{D1} = I_{D2} = \frac{I_1}{2}$ (d) $I_1 = 28.18$ mA

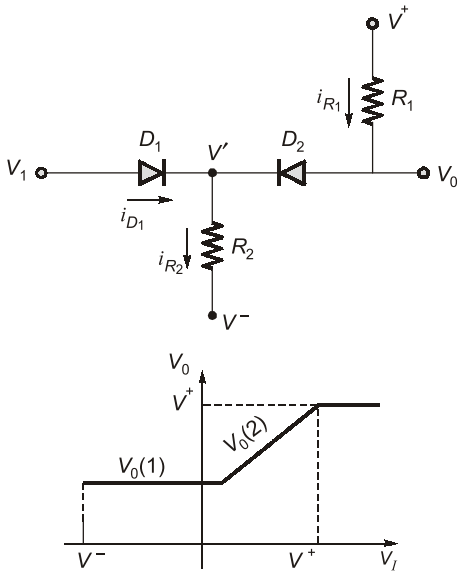
Q.117 For the network shown below, which of the following option(s) is/are correct regarding the range of R_L and I_L that will result in V_{RL} being maintained at 10 V.



(a) $R_{L\,min} = 250\ \Omega$ (b) $I_{L\,min} = 8$ mA

(c) $R_{L\,max} = 1.25$ kΩ (d) $I_R = 40$ mA

Q.118 For the circuit shown below :



Assume the circuit parameters are $R_1 = 5$ kΩ, $R_2 = 10$ kΩ, $V_\gamma = 0.7$ V, $V^+ = +5$ V and $V^- = -5$V

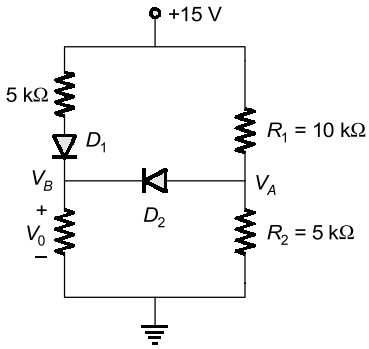
(a) For $V_1 = 0$, $i_{R1} = 0.62$ mA

(b) For $V_1 = 4$ V, $i_{R1} = 0.2$ mA

(c) For $V_1 = 4$ V, $i_{R2} = 0.83$ mA

(d) For $V_1 = 4$ V, $i_{D1} = 0.63$ mA

Q.119 For the circuit shown below :

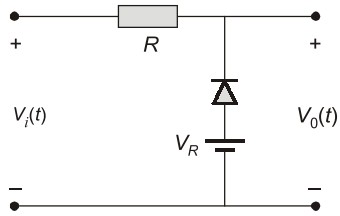


Which of the following are correct?

(a) $V_A = 7.62$ V (b) $V_B = 6.92$ V

(c) $V_A = 5$ V (d) $V_B = 9.53$ V

Q.120 Assuming ideal diode characteristics, the input/output voltage relationship for the circuit shown in figure is



(a) When $V_i(t) \le V_R$; $V_0 = V_R$

(b) When $V_i(t) \le V_R$; $V_0 = V_i(t)$

(c) When $V_i(t) > V_R$; $V_0 = V_R$

(d) When $V_i(t) > V_R$; $V_0 = V_i(t)$

■■■■

Answers Basics of Semiconductor Diodes

1. (c)	2. (c)	3. (d)	4. (a)	5. (d)	6. (c)	7. (b)	8. (b)
9. (a)	10. (a)	11. (c)	12. (d)	13. (4)	14. (0)	15. (d)	16. (a)
17. (a)	18. (c)	19. (c)	20. (a)	21. (c)	22. (d)	23. (c)	24. (b)
25. (b)	26. (a)	27. (d)	28. (c)	29. (a)	30. (c)	31. (c)	32. (d)
33. (d)	34. (b)	35. (c)	36. (b)	37. (d)	38. (c)	39. (a)	40. (b)
41. (a)	42. (c)	43. (d)	44. (c)	45. (b)	46. (d)	47. (b)	48. (d)
49. (b)	50. (a)	51. (d)	52. (b)	53. (d)	54. (b)	55. (c)	56. (d)
57. (b)	58. (a)	59. (a)	60. (b)	61. (d)	62. (b)	63. (b)	64. (c)
65. (c)	66. (c)	67. (500)	68. (1.048)	69. (b)	70. (d)	71. (b)	72. (b)
73. (c)	74. (d)	75. (b)	76. (a)	77. (c)	78. (b)	79. (b)	80. (d)
81. (d)	82. (a)	83. (d)	84. (b)	85. (b)	86. (c)	87. (d)	88. (c)
89. (c)	90. (b)	91. (a)	92. (b)	93. (d)	94. (c)	95. (d)	96. (b)
97. (c)	98. (d)	99. (d)	100. (c)	101. (b)	102. (c)	103. (a)	104. (b)
105. (c)	106. (a)	107. (b)	108. (a)	109. (a)	110. (c)	111. (0.12)	112. (40)
113. (0.5147)	114. (10)	115. (b)	116. (c,d)	117. (a,b,c,d)	118. (a,b,c,d)	119. (c,d)	120. (a,d)

Explanations Basics of Semiconductor Diodes

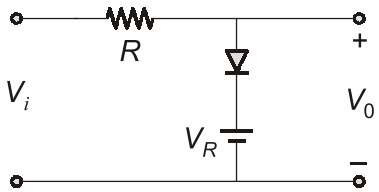
1. (c)

$$\frac{1}{r_d} = \frac{\partial I_D}{\partial V} = \frac{I_D}{V_T}$$

r_d : dynamic resistance.

$$\therefore \quad r_d = \frac{V_T}{I_D} = \frac{25}{4} = 6.25\ \Omega$$

2. (c)



Considering ideal diode :

for $V_i < V_R$, diode is OFF hence there is no current through R and $V_0 = V_i$.

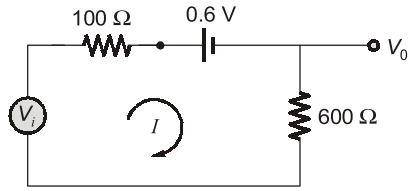
For $V_i > V_R$, diode is ON hence

$$V_0 = V_R$$

(as diode will act as short circuit)

3. (d)

For $0 \le t \le 1$, diode is ON



$$I = \frac{V_i - 0.6}{100 + 600} = \frac{10 - 0.6}{700}$$

$$= 0.01343\ \text{A}$$

$$\therefore \quad V_0 = 600 \times 0.01343 = 8.058\ \text{V}$$

For $1 < t < 2$, diode is OFF, there will be no current in the circuit and hence

$$V_0 = 0\ \text{V}$$

Hence output waveform can be given as shown below:

4. (a)

For $0 < t < t_s$ diode will remain ON and hence

$$V_R + 5 = 0$$

$$\therefore \quad V_R = -5\ \text{V}$$