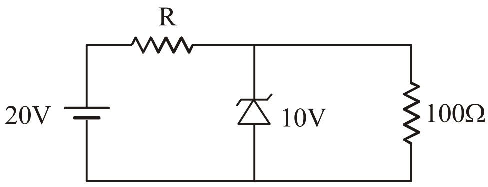
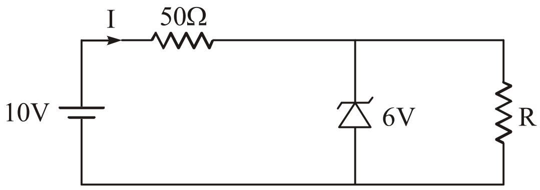
QUESTION BANK

1. Figure shows as electronic voltage regulator the zener diode may be assumed to require a minimum current of 25 mA for satisfactory operations. The value of R required for satisfactory voltage regulation of the circuit is

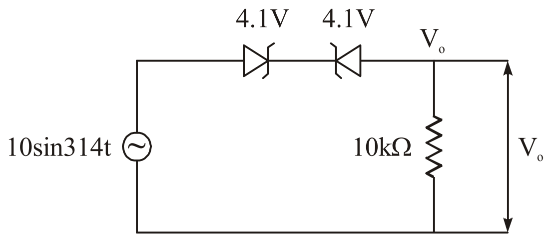


2. The 6V Zener diode shown in fig has zero Zener resistance and a Knee current of 5mA. The minimum value of R so that the voltage across it does not fall bellow 6 V is.

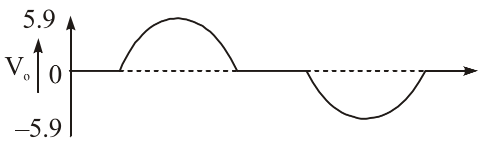


(a) 1.2K ohms (b) 80 ohms
(c) 50 ohms (d) 0 ohms

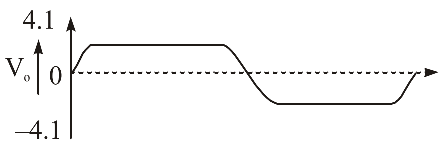
3. The wave shape of V_0 in Fig. is



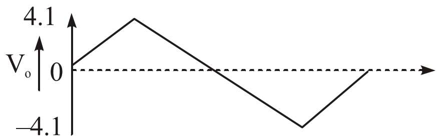
(a)



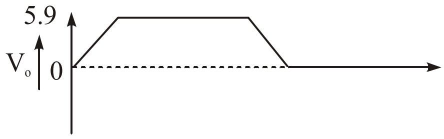
(b)



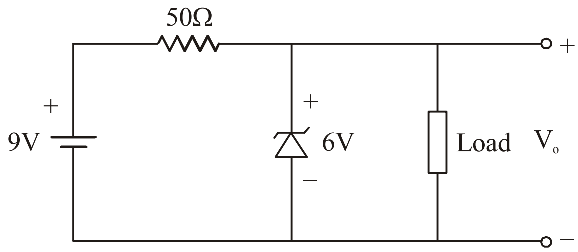
(c)



(d)



4. The Zener diode in the circuit shown in the figure has a Knee current of 5mA, and a maximum allowed power dissipation of 300mW. What are the minimum and maximum load currents that can be drawn safely from the circuit, keeping the output voltage V_0 constant at 6 V?



(a) 0 mA, 180 mA
(b) 5mA, 110 mA
(c) 10 mA, 55 mA
(d) 60mA, 180mA

5. For full wave rectification, a four diode bridge rectifier is claimed to have the following advantages over a two diode circuit.

1. Less Expensive transformer
2. Smaller size transformer and
3. Suitability for higher voltage application of these

(a) only (1) and (2) are true
(b) only (1) and (3) are true
(c) only (2) and (3) are true
(d) (1), (2), as well as (3) are true

6. A dc power supply has a No-load voltage of 30V and a full-load voltage of 25V at a full-load current of 1A. The output resistance and load regulation, respectively are

(a) 5Ω and 20% (b) 25Ω and 20%

(c) 5Ω and 16.7% (d) 25Ω and 16.7%

7. The mobility of an electron in a conductor expressed in terms of

(a) $Cm^2/V\text{–}sec$ (b) $Cm/V\text{–}sec$

(c) Cm^2/V (d) Cm^2/sec

8. As temperature is increased, the voltage across a diode carrying a constant current.

(a) Increases

(b) Decreases

(c) Remains Constant

(d) May increase or decrease depending upon the doping levels in the junction

9. In a single-stage differential amplifier, the output offset voltage is basically dependent on the mismatch of

(a) V_{BE}, I_B and β (b) V_{BE} and I_B

(c) I_B and β (d) V_{BE} and β

10. The input resistance of a common emitter stage can be increased by

1. un-bypass emitter resistance

2. bootstrapping

3. biasing it at low quiescent current

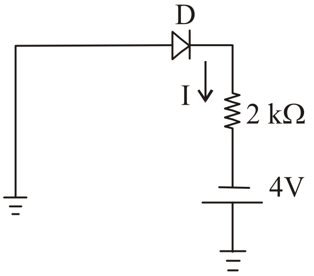
4. using compounded BJTs

The correct sequence in descending order of the effectiveness of these methods is

(a) 2, 4, 1,3 (b) 4, 3, 2, 1

(c) 2, 4, 3, 1 (d) 4, 2, 3, 1

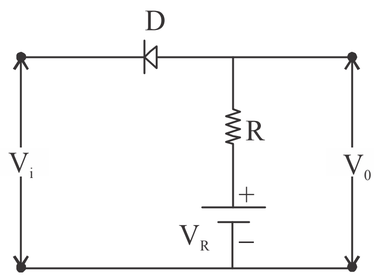
11. The diode 'D' is ideal in the network shown in the given figure. The current 'I' will be



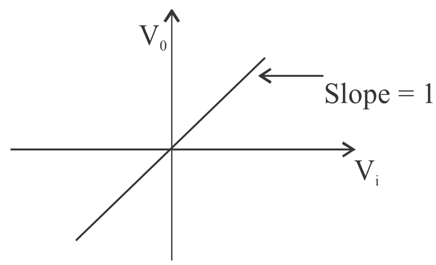
(a) –mA (b) zero

(c) 2mA (d) 4mA

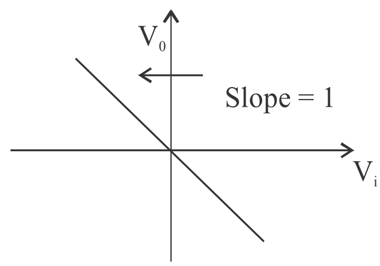
12. The transfer characteristic of the network shown in the given figure is represented as



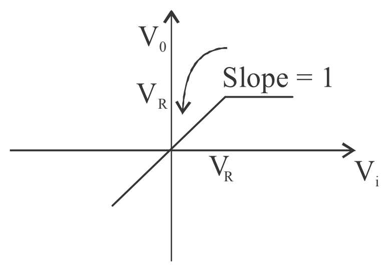
(a)



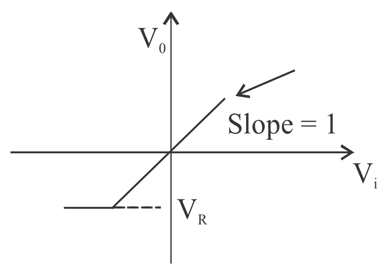
(b)



(c)



(d)



13. A diode whose terminal characteristics are related as $i_D = I_S \, e^{\frac{V}{V_T}}$, where Is is the reverse saturation current and V_T is thermal voltage (=25 mV) is biased at i_D = 2 mA. Its dynamic resistance is_______

(a) 25 Ω (b) 12.5 Ω
(c) 50 Ω (d) 100 Ω

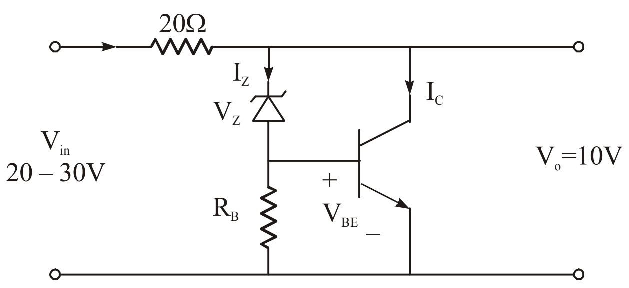
14. Consider the following rectifier circuits:

1. Half-wave rectifier without filter.
2. Full-wave rectifier without filter.
3. Full-wave rectifier with series inductance filter.
4. Full-wave rectifier with capacitance filter.

The sequence of these rectifier circuits in decreasing order of their ripple factor is

(a) 1,2,3,4 (b) 3,4, 1,2
(c) 1,4,3,2 (d) 3, 2, 1,4

15. The transistor shunt regulator shown in the figure has a regulated output voltage of 10V. The input varies from 20V to 30V. The relevant parameters for Zener diode and the transistor are :
V_z = 9.5V, V_{BE} = 0.3V, β = 99.
Neglect the current through R_B. Then the maximum power dissipated in the Zener diode (P_Z) and the transistor (P_T) are



(a) P_Z = 75 mW, P_T = 7.9W
(b) P_Z = 85 mW, P_T = 8.9W
(c) P_Z = 95 mW, P_T = 9.9W
(d) P_Z = 115 mW, P_T = 11.9W

16. The use of a rectifier filter in a capacitor circuit gives satisfactory performance only when the load

(a) current is high (b) current is low
(c) voltage is high (d) voltage is low

17. ***Assertion (A):*** In avalanche breakdown, the reverse current sharply increases with voltage due to field emission.

Reason (R): The field emission requires highly doped 'p' and 'n' regions.

(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is NOT the correct explanation of A
(c) A is true but R is false
(d) A is false but R is true

18. ***Assertion (A):*** In small signal class 'A' amplifier, the output is a magnified replica of the input without any change in frequency.

Reason (R): The dc operating point is fixed in class 'A' position.

(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is NOT the correct explanation of A
(c) A is true but R is false
(d) A is false but R is true

19. In a forward biased photo diode, an increase in incident light intensity causes the diode current to

(a) increase
(b) remain constant
(c) decrease
(d) remain constant while the voltage drop across the diode increases

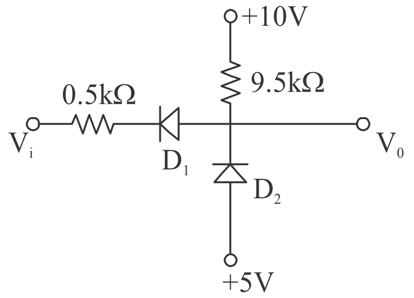
20. A Zener diode has a Zener resistance of 5Ω. If the current through the Zener diode changes from 10 mA to 20 mA, the change of voltage across the Zener diode will be

(a) 0.05 v (b) 0.075 v
(c) 0.1 v (d) 0.5 v

21. A peak detector comprises a capacitor and an ideal diode and an ac source in series . The following is true the circuit.

(a) The instantaneous current depends only on the instantaneous source voltage
(b) The diode voltage is always zero
(c) The instantaneous current depends only on the diode
(d) The energy stored in the capacitor can never decrease with time.

22. Choose the incorrect answer Given the diode cut in voltage $V_D = 0.6$ V



(a) For $0 \le V_1 \le 3.5$ V, $V_0 = 4.4$ V

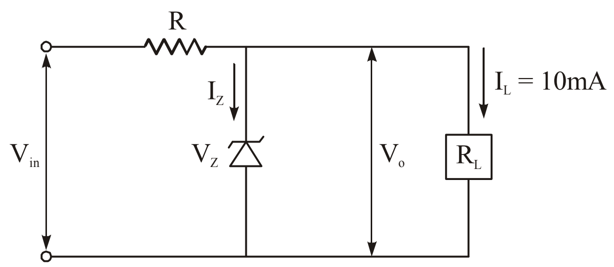
(b) For $V_i \ge 3.8$ V, D_2 turns ON

(c) For $V_i \ge 3.5$ V, D_2 turns OFF

(d) $V_i \ge 9.4$ V, $V_0 = 10$ V

23. A Zener diode Regulator in the figure is to be designed to meet the specifications:

$I_L = 10$ mA, $V_0 = 10$V and V_{in} varies from 30V to 50V. The Zener diode has $V_z = 10$V and I_{ZK} (Knee current) = 1mA. For satisfactory operation.



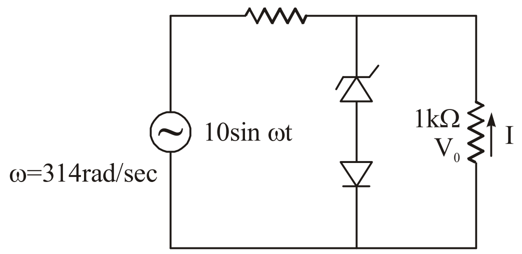
(a) $R \le 1800\ \Omega$

(b) $2000\ \Omega \le R \le 2200\ \Omega$

(c) $3700\ \Omega \le R \le 4000\ \Omega$

(d) $R > 4000\ \Omega$

24. The cutin voltage of both zener diode D_z and D shown in Figure is 0.7 V, while breakdown voltage of the zener is 3.3 V and reverse break down of D is 50 V. The other parameters can be assumed to be the same as those of an ideal diode. The values of the peak output voltage (V_0) are



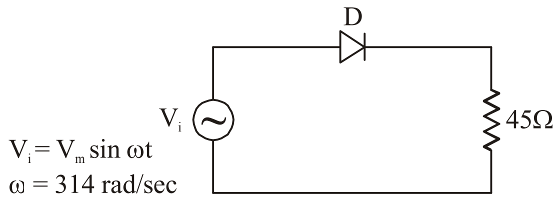
(a) 3.3 V in the positive half cycle and 1.4 V in the negative half cycle.

(b) 4 V in the positive half cycle and 5 V in the negative half cycle.

(c) 3.3 V in the both positive and negative half cycle.

(d) 4 V in the both positive and negative half cycle.

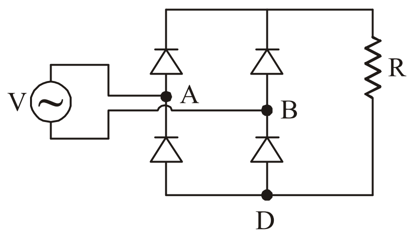
25. The forward resistance of the diode shown in figure is 5Ω and the remaining parameters are same as those of ideal diode. The DC component of the source current is



(a) $\dfrac{V_m}{50\pi}$ (b) $\dfrac{V_m}{50\pi\sqrt{2}}$

(c) $\dfrac{V_m}{100\pi\sqrt{2}}$ (d) $\dfrac{V_m}{50\pi}$

26. In the single phase diode bridge rectifier shown in figure, the load resistor is R = 50Ω. The source voltage is V = 200 sin ωt, where ω = 2π × 50 rad/sec. The power dissipated in the load resistor R is



(a) $\dfrac{3200\text{W}}{\pi}$ (b) 400 W

(c) $\dfrac{400\text{W}}{\pi}$ (d) 800 W

27. The junction capacitance of linearly graded junction varies with the applied reverse bias V_r as

(a) V_r^{-1} (b) $V_r^{-1/2}$

(c) $V_r^{-1/3}$ (d) $V_r^{1/2}$

28. The power input to an amplifier is 2 μW. The power gain of the amplifier is 40 dB. The output power of the amplifier is

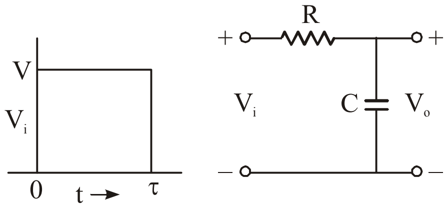
(a) 80 μW (b) 200 μW

(c) 20 mW (d) 80 mW

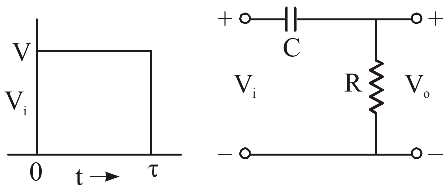
29. Given below are 2 sets of diagram - one set shows 4 circuits with inputs; the other shows the output (V_0). Match List-I (Inputs) with List-II (Outputs) and select the correct answer using the codes given below the lists:

List-l

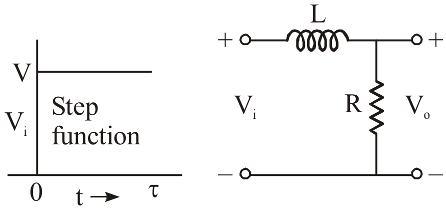
A.



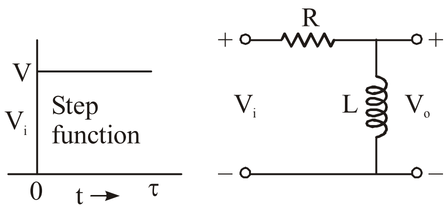
B.



C.

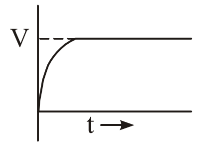


D.

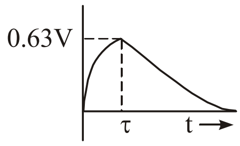


List-II

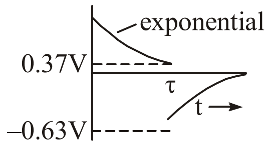
1.



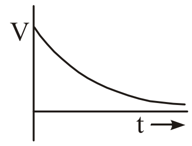
2.



3.

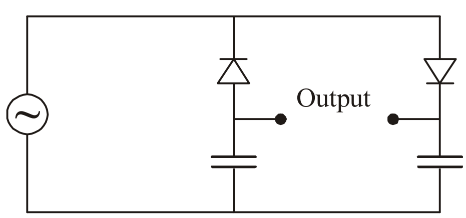


4.



Codes:	A	B	C	D
(a)	1	3	2	4
(b)	2	3	1	4
(c)	1	4	2	3
(d)	2	4	1	3

30. The circuit shown in figure is best described as a



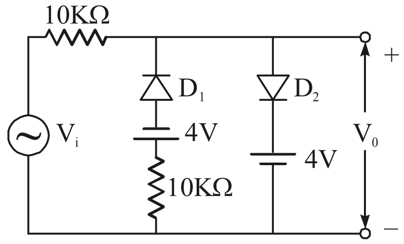
(a) bridge Rectifier

(b) Ring Modulator

(c) frequency discriminator

(d) Voltage doubler

31. A voltage signal 10 sin cot is applied to the circuit with ideal diodes as shown in figure. The max and minimum values of the output waveform of the circuit are respectively



(a) +10V and –10V (b) +4V and –4V
(c) +7V and –4V (d) +4V and –7V

32. Consider the following statements in respect of a transistor R-C coupled amplifier:

1. The low frequency response is determined by the transistor junction capacitors.

2. The high frequency response is limited by coupling capacitors,

3. The Miller capacitance reduces the gain at high frequencies.

4. As the gain is increased the bandwidth gets reduced.

Which of these statements are correct?

(a) 1 and 2 (b) 2 and 3
(c) 3 and 4 (d) 1 and 4

33. Match List-I (Circuit Name) with List-II (Characteristics) and select the correct answer using the codes given below the lists:

List-I

A. Schmitt trigger

B. Monostable multivibrator

C. Astable multivibrator

D. Blocking oscillator

List-II

1. It needs a pulse transformer

2. It is used to generate gating pulse whose width can be controlled

3. It is a bistable circuit

4. It has no stable state Codes:

Codes:	A	B	C	D
(a)	3	2	4	1
(b)	2	3	1	4
(c)	3	2	1	4
(d)	2	3	4	1

34. Match List-I (Circuits) with List-II (Characteristics/Application) and select the correct answer.

List-I	List-II
A. High-pass RC circuit	**1.** Comparator
B. Low-pass RC circuit	**2.** DC restorer
C. Clamping circuit	**3.** Integrator
D. Clipping circuit	**4.** Differentiator
	5. Compensated Attenuator

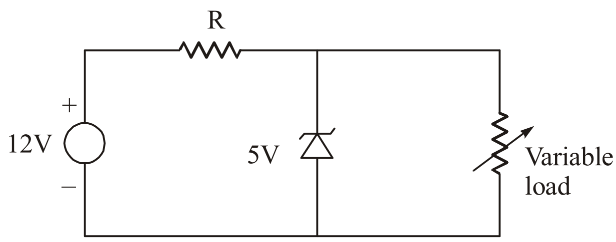
Codes:	A	B	C	D
(a)	5	4	2	1
(b)	4	3	1	2
(c)	5	4	1	2
(d)	4	3	2	1

35. ***Assertion (A):*** A clipper circuit can be realized using two biased diodes in shunt.

Reason (R): A clipper circuit slices the input waveform between two preset voltage levels.

(a) Both A and R are individually true and R is the correct explanation of A.
(b) Both A and R are individually true and R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

36. In the voltage Regulator shown in the figure, the load current can vary from 100 mA to 500 mA. Assuming that the Zener diode is ideal (i.e. Zener Knee current is negligibly small and Zener Resistance is zero in the breakdown Region), the value of 'R' is.



(a) 7 Ω (b) 70 Ω
(c) 70/3 Ω (d) 14 Ω

37. In a full - Wave Rectifier using two ideal diodes, V_{dc} and V_m are the dc and peak values of the voltage respectively across a Resistive load. If PIV is the peak inverse voltage of the diodes, then the appropriate relationships for this Rectifier are

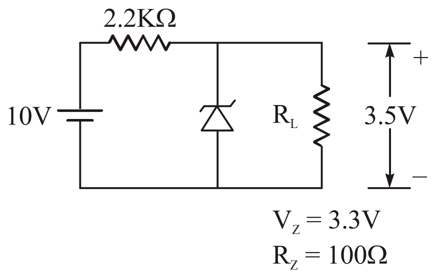
(a) $V_{dc} = \frac{V_m}{\pi}$, PIV = $2V_m$

(b) $V_{dc} = \frac{2V_m}{\pi}$, PIV = V_m

(c) $V_{dc} = \frac{2V_m}{\pi}$, PIV = $2V_m$

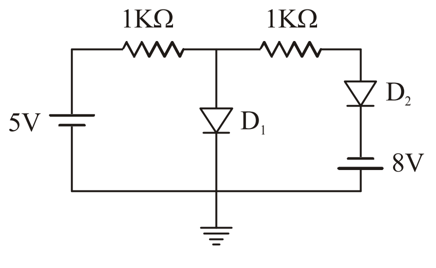
(d) $V_{dc} = \frac{V_m}{\pi}$, PIV = V_m

38. The current through the zener diode in the given circuit is



(a) 33 mA (b) 3.3 mA
(c) 2mA (d) 0 mA

39. Assuming that the diodes are ideal in figure the current in the diode D_1 is



(a) 8 mA (b) 5 mA
(c) 0 mA (d) –3 mA

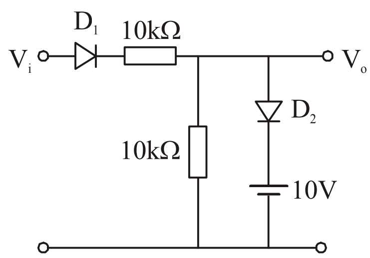
40. Which one of the following statements is correct? A photodiode works on the principle of

(a) photovoltaic effect
(b) photo-conductive effect
(c) photo-electric effect
(d) photo-thermal effect

41. Which one of the following statements is not correct in respect of a series transistor feedback voltage regulator ?

(a) The regulation factor can be improved by increasing the h_{fe} of the shunt transistor
(b) The regulation factor can be improved by increasing the resistance between the collector of the shunt transistor and the collector of the series transistor
(c) Output resistance can be reduced by using a Darlington pair in place of the series transistor
(d) Output resistance can be reduced by reducing the h_{fe} of the shunt transistor

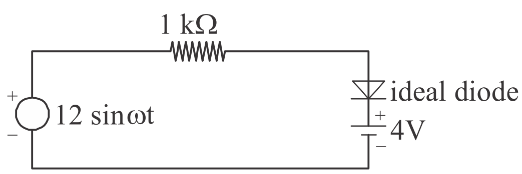
42. Consider the following circuit :



For the circuit shown above, which one of the following is a correct statement?

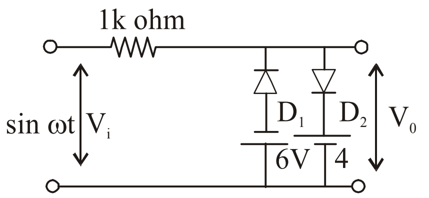
(a) D_2 does not conduct for any value of V_i
(b) V_0 = 10 V for all values of V_i > 10 V
(c) V_0 = 0 V for all values of V_i < 0 V
(d) V_0 = 10 V for all values of V_i > 0 V

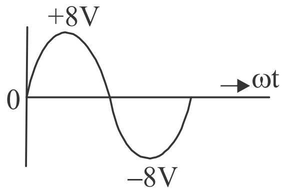
43. The peak current through the resistance in the circuit shown is

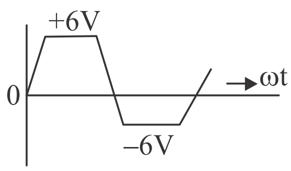


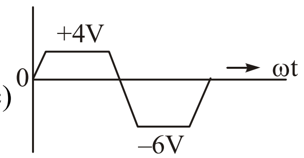
(a) 18 mA (b) 12 mA
(c) 8 mA (d) 4 mA

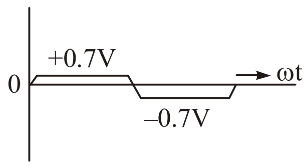
44. For the circuit shown in the figure, which one of the following waveforms represents the correct output ?



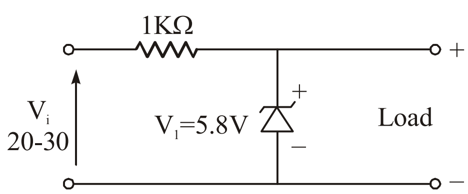
(a)


(b)


(c)


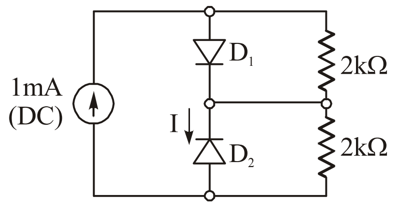
(d)


45. The Zener diode in the regulator circuit shown in the figure has a Zener Voltage of 5.8 volts and a Zener Knee current of 0.5 mA. The maximum load current drawn form this circuit ensuring proper functioning over the input voltage range between 20 and 30 volts, is



(a) 23.7 mA (b) 14.2 mA
(c) 13.7 mA (d) 24.2 mA

46. Assume that D_1 and D_2 in figure are ideal diodes the value of current I_s is



(a) 0 mA (b) 0.5 mA
(c) 1 mA (d) 2 mA

47. Two p-n junction diodes are connected back to back to make a transistor. Which one of the following is correct?

(a) The current gain of such a transistor will be high
(b) The current gain of such a transistor will be moderate
(c) It cannot be used as a transistor due to large base width
(d) It can be used only for pnp transistor

48. In a p-type silicon sample, the hole concentration is 2.25×10^{15}/cc. If the intrinsic carrier concentration is 1.5×10^{10}/cc, what is the electron concentration in the p-type silicon sample

(a) zero (b) 10^{10}/cc
(c) 10^{5}/cc (d) 1.5×10^{25}/cc

49. What is the reverse recovery time of a diode when switched from forward bias V_F to reverse bias V_R?

(a) Time taken to remove the stored minority carriers
(b) Time taken by the diode voltage to attain zero value
(c) Time to remove stored minority carriers plus the time to bring the diode voltage to reverse bias V_R.
(d) Time taken by the diode current to reverse.

50. When a voltage divider biased amplifier has its Q-point near to the middle of the dc-load line, what is the maximum undipped peak-to-peak output voltage?

(a) V_{CEQ} (b) $I_{CQ}r_L$
(c) $2I_{CQ}r_L$ (d) $2V_{CEQ}$

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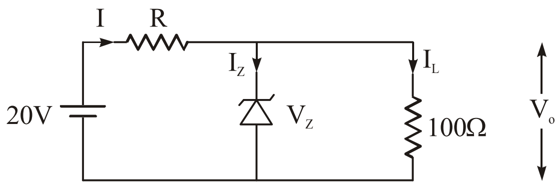
ANSWERS AND EXPLANATIONS

1. From the given problem



$$V_0 = V_Z = 10V$$

$$I_{Zmin} = 25 \text{ mA}$$

$$I = \left(\frac{20-10}{R}\right)$$

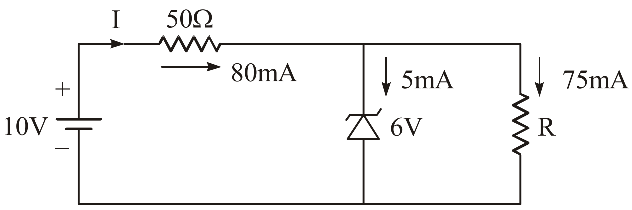
But $\quad I_L = \frac{V_o}{100} = \frac{V_z}{100} = \frac{10}{100}$

$$I_L = 100mA$$

$\therefore \quad I = I_z + I_L = 125mA$

$$R = \frac{10}{I} = \frac{10}{125 \times 10^{-3}} = 80\Omega$$

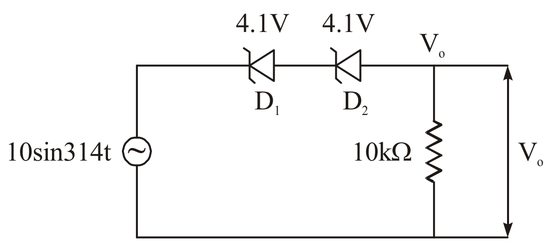
2. ***Ans. (b)***



$$I = \left(\frac{10-6}{50}\right) = \frac{4}{50} = 0.08 \text{ A}, \; I = 80 \text{ mA}$$

$$R_{(min)} = \frac{V}{I_{L(max)}} = \frac{6}{75 \times 10^{-3}} = 80\Omega$$

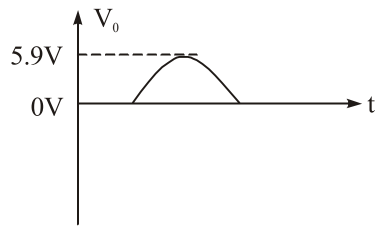
3. ***Ans. (a)***

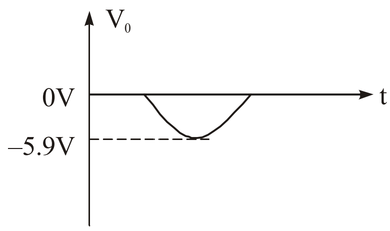


During +ve half cycle D_2 acts as voltage regulator.

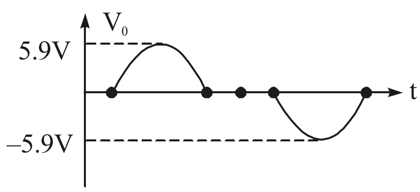
D_1 acts as a PN diode short circuited during Forward bias.

When i/p applied >4.1V D_2 starts conducting.





Similarly during negative cycle D_1 acts as voltage regulator, D_2 is Forward biased.



4. ***Ans. (c)***

$$I_{in} = \frac{9-6}{50} = 0.06A = 60 \text{ mA}$$

Maximum current through the Zener diode is

$$\frac{300 \times 10^{-3}}{6} = 50mA$$

Minimum current through the load is 60 – 50 = 10mA

Maximum current through the load is 60 – 5 = 55mA

5. ***Ans. (d)***

A four diode bridge Rectifier uses smaller size transformer with no center tap and and suitable for high voltage applications.

6. ***Ans. (b)***

Given No-load voltage = 30V

full-load voltage = 25V

full-load current = 1A

$$\text{Regulation} = \frac{\text{No load} - \text{full load}}{\text{full load}}$$

$$= \frac{30-25}{25} = \frac{1}{5} = 20\%$$

$$\text{Output Resistance} = \frac{\text{full load nvoltage}}{\text{full load current}}$$

$$= \frac{25}{1} = 25\Omega$$

7. ***Ans. (a)***

8. ***Ans. (b)***

When temperature increases the current passing through the diode increases. But to maintain the carrying current as constant, voltage across the diode must be decreased.

9. ***Ans. (d)***

10. ***Ans. (a)***

11. ***Ans. (c)***

12. ***Ans. (c)***

13. ***Ans. (b)***

$$R_{ac} = \frac{\text{Change in voltage across diode}}{\text{Change in current through diode}} = \frac{dv}{dI_D}$$

Diff. eq. w.r.t V

$$\frac{dv}{dI_D} = I_s \cdot e^{\frac{V}{V_T}} \cdot \frac{1}{V_T} = \frac{I_D}{V_T}$$

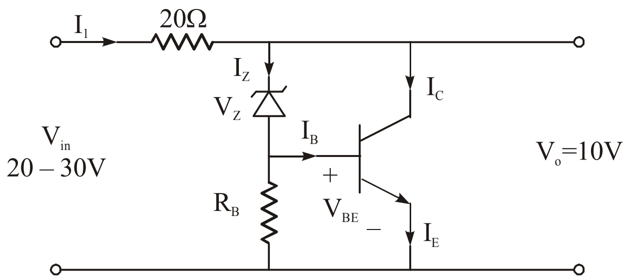
$$\therefore \quad R_{ac} = \frac{V_T}{I_D} = \frac{25\times10^{-3}}{2\times10^{-3}} = 12.5\Omega$$

14. ***Ans. (a)***

15. ***Ans. (c)***

Given $V_z = 9.5V$,

$V_{BE} = 0.3V$, $\beta = 99$



$$I_{1\ max} = \frac{V_{in\,max} - V_o}{20} = \frac{30-10}{20} = 1$$

$I_{1\ max} = 1$ A

$I_E = I_C + I_B$ ...(1)

$I_B = I_Z$ (when no current flows in R_B).

$$\text{Then} \quad \beta = \frac{I_C}{I_B} = \frac{I_C}{I_Z}$$

$I_C = \beta I_Z$

$\therefore \quad I_E = \beta I_Z + I_B = \beta I_Z + I_Z \quad [\because I_B = I_Z]$

$I_E = (\beta+1)I_Z = (99+1)I_Z \quad [\because \beta = 99\,\text{given}]$

$I_E = 100\times I_Z$

$I_1 = I_E = 100\times I_Z$

$$I_Z = \frac{I_1}{100} = \frac{1}{100} = 0.01\text{A}$$

$P_Z = V_Z\ I_Z$

$= 9.5 \times 0.01$ (∇ $V_z = 9.5$ given)

= 95 mW

$I_C = \beta\ I_Z$

$= 99\ I_Z = 99 \times 0.01 = 0.99$ A

P_T (or) $P_C = V_C\ I_C$

$= 10 \times 0.99 = 9.9$ W

16. ***Ans. (b)***

17. ***Ans. (d)***

A is wrong because avalanche breakdown takes place due to a large no. of breaking of covalent bonds across the junction due to impact ionization due to highly energetic electron collision.

18. ***Ans. (b)***

Both are correct since operating point for class A amplifier is at the middle of dc load line so as for whole cycle of i/p it work in linear range of transistor so as to work as amplifier so having characteristic like y = kx where y is o/p and x is i/p so at the o/p frequencies at i/p will be present. But R is not the region for A.

19. ***Ans. (b)***

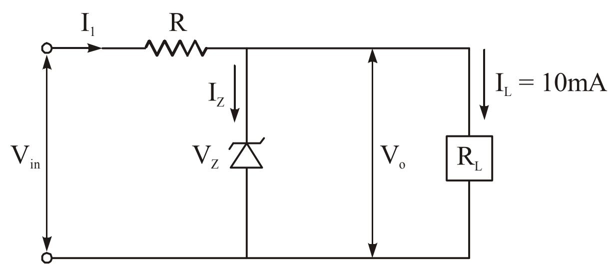
In case of F.b. photo diode it is sensitive to incident light and behave as a normal diode so diode current remains same irrespective of intensity of incident light.

20. ***Ans. (a)***

21. ***Ans. (d)***

22. ***Ans. (b)***

23. ***Ans. (a)***



$$I_1 = \frac{V_{in} - V_o}{R} \geq I_Z + I_L$$

Given I_Z = 1 mA, I_L = 10 mA

If V_{in} = 30V

$$I_1 = \frac{30-10}{R} \geq (10+1)\text{mA} = \frac{20}{R} \geq 11\times10^{-3}$$

$$R \leq 1818\ \Omega \qquad ...(1)$$

If V_{in} = 50V

$$I_1 = \frac{50-10}{R} \geq (10-1)\text{mA} = \frac{40}{R} \geq 11\times10^{-3}$$

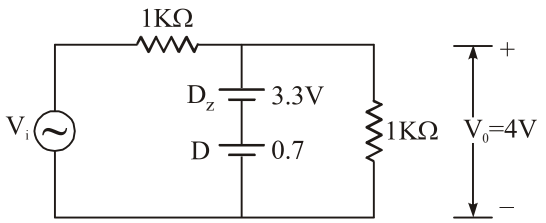
$$R \leq 3636\ \Omega \qquad ...(2)$$

From equation (1) and (2)

$\therefore \quad R \leq 1818\ \Omega$

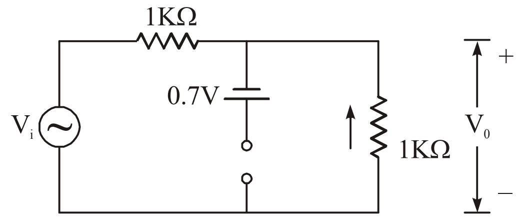
24. ***Ans. (b)***

During the positive half cycle, when Vi > 4 V zener replaced by V_2 (ON) & D replaced by 0.7 V



During the negative half cycle

Zener diode becomes forward biased and PN junction diode becomes reverse biased, then



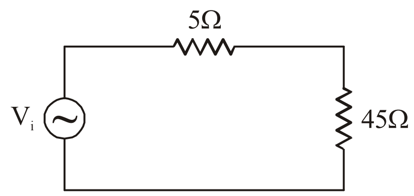
$$V_0 = \frac{V_i}{2} = -5\sin\omega t$$

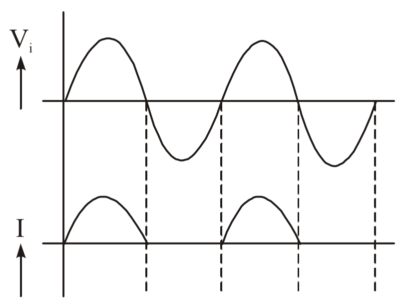
$$V_{omax} = -5V$$

25. ***Ans. (a)***

During positive half cycle

D – F.B replaced by 5Ω





$$i(t) = \frac{V_i}{50},\ i(t) = \frac{V_m}{50}\sin\omega t$$

DC component is

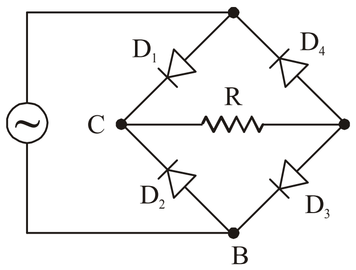
$$Id_C = \left(\frac{\frac{V_m}{50}}{\pi}\right) = \left(\frac{V_m}{50\pi}\right)$$

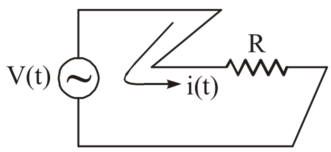
During negative half cycle, D – R.B – replaced by O.C

$$\Rightarrow \qquad I = 0$$

26. ***Ans. (c)***

The given circuit can be redrawn as





During the positive half cycle of the i/p then

D_1 & D_3 – ON, $\rightarrow$ S.C

D_2 & D_4 – Off – O.C

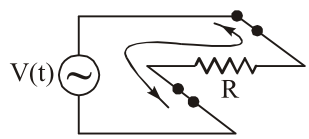
$$i(t) = \frac{v(t)}{R} = \frac{200\sin\omega t}{50}$$

$$= 4\ \sin\ \omega t.\ \text{Amp}$$

During the negative half cycle of the input,

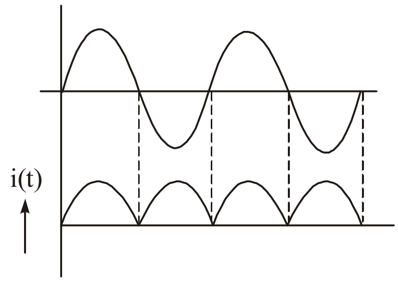
D_1 & D_3 – off $\rightarrow$ O.C

D_2 & D_4 – ON $\rightarrow$ S.C



$$i(t) = \frac{v(t)}{R} = 4\sin\omega t$$

Full Wave Rectifier – power dissipated in the load resistor R is



$$P = \frac{v(t)}{\sqrt{2}} \times \frac{i(t)}{\sqrt{2}} = \frac{200}{\sqrt{2}} \times \frac{4}{\sqrt{2}}$$

$$P = 400W$$

27. ***Ans. (c)***

For step-graded junction $C_T \propto V^{-1/2}$ and for linearly graded junction $C_T \propto V^{-1/3}$

28. ***Ans. (c)***

29. ***Ans. (b)***

30. ***Ans. (d)***

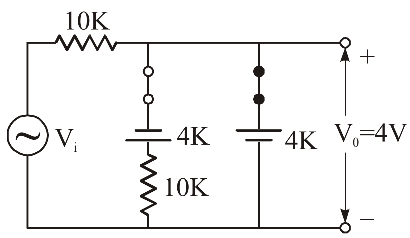
31. ***Ans. (d)***

For positive half cycle

(i) (When V_i>4V) D_2ON, D_1 = off then

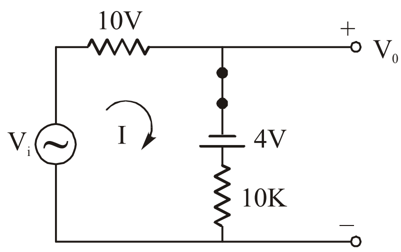
(ii) When V_i<4V, D_1 & D_2 – OFF $\Rightarrow V_0 - V_i$

(iii) For negative half cycle, D_1–ON, & D_2–OFF



$$v_i - 10I + 4 - 10I = 0$$

$$I = \left(\frac{V_i + 4}{20}\right) mA$$



When $V_i = -10V$ (max.value)

$$I = \frac{-6}{20}\text{mA}, \quad V_0 + 4 - 10I = 0$$

$$V_0 = 10I - 4 = 10\left(\frac{-6}{20}\right) - 4$$

$$= -3 - 4 \Rightarrow V_0 = -7V$$

32. ***Ans. (c)***

33. ***Ans. (a)***

34. ***Ans. (d)***

High pass RC circuit $\rightarrow$ act as differentiator for low RC.

Low pass RC circuit $\rightarrow$ act as integrator for high RC (time constant)

Clamping circuit act as DC inserter or DC restorer. Clipping circuit act as comparator $\rightarrow$ as it compares i/p wrt certain DC voltage and clips off the portion accordingly.

35. ***Ans. (a)***

36. ***Ans. (d)***

$$\frac{V_{in} - V_Z}{R} \geq I_L + I_Z, \quad \frac{12-5}{R} \geq I_L$$

$$[\because I_Z = 0 \text{ given}]$$

where $I_L = 100mA$

$$\frac{12-5}{R} \geq 100mA, \quad \frac{7 \times 100}{100} \geq R$$

$$\therefore R < = 70\Omega$$

where $I_L = 500mA$

$$\frac{12-5}{R} \geq 500mA, \quad \frac{7 \times 100}{500} \geq R$$

$$\therefore R < = 14\Omega$$

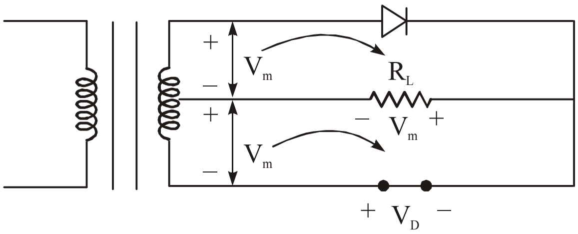
Take minimum value i.e., $R = 14\Omega$

37. ***Ans. (c)***

$$V_{dc} = I_{dc} \cdot R_L$$

($\therefore$ V_{dc} in Full Wave Rectifier)

$$= \frac{2I_m}{\pi} \cdot R_L \quad \left(\because I_{dc} = \frac{2I_m}{\pi}\right), \quad V_{dc} = \frac{2V_m}{\pi}$$



PIV in Full Wave Rectifier:

Apply KVL $V_m + V_m + V_D = 0$

$$V_D = -2V_m$$

$$\therefore \quad PIV = 2V_m$$

38. ***Ans. (c)***

Given that $V_0 = 3.5V$

$$V_Z = 3.3V$$

Then zener offers

$$R_z = \frac{\Delta V_0}{I_z}$$

$R_z = 0.1\ k\Omega$ of dynamic resistance.

So $\quad V_x + V_z = 3.5$

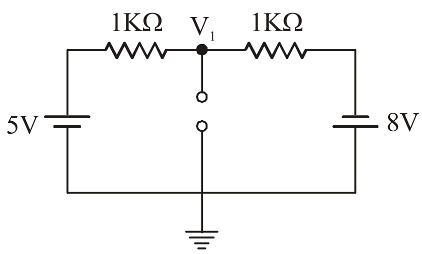
$$I_x = \left(\frac{3.5 - 3.3}{R_z}\right) = 2mA$$

39. ***Ans. (c)***

From the Circuit D_2 must be in Forward bias where D_1–first replace by O.C

Apply Nodal analysis at

$$\frac{V_1 - 5}{10^3} + \frac{V_1 + 8}{10} = 0$$



$$V_1 - 5 + V_1 + 8 = 0$$

$$2V_1 = -3$$

$$V_1 = -1.5V$$

$\therefore$ D_1 is Reverse biased

$$I_{D_1} = 0$$

40. ***Ans. (b)***

41. ***Ans. (d)***

42. ***Ans. (c)***

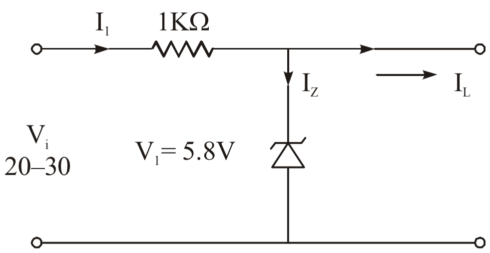
43. ***Ans. (c)***

44. ***Ans. (c)***

45. ***Ans. (a)***

Given $V_i = 5.8V$

$R = 1K$



The Maximum load current will be

when $V_i = V_{max} = 30V$

$$\frac{V_{max} - V_Z}{R} \geq I_L + I_Z$$

$$\frac{30 - 5.8}{1k} \geq I_L + 0.5 \times 10^{-3}$$

$$\frac{24.2}{1k} \geq 0.5 \times 10^{-3} + I_L$$

$$24.2 \times 10^{-3} \geq 0.5 \times 10^{-3} + I_L$$

$$I_L = 23.7 \text{ mA}$$

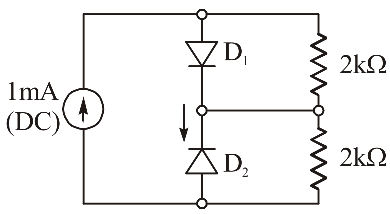
46. ***Ans. (a)***

The current always selects the low resistance path. D_1-ON and D_2-OFF.

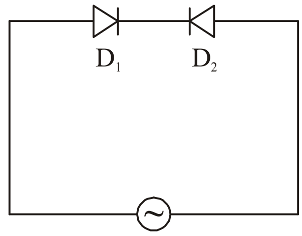
The I directed from N type to P–type (D_2–R.B)

As D_2–R.B replaced by O.C

$\therefore$ $I = 0$



47. ***Ans. (c)***



This configuration will not work as a transistor because base width will be too large . So that carrier injected from forward biase diode (equivalent to emitter – base junction) will not reach to collector.

48. ***Ans. (c)***

Given that

$p = 2.25 \times 10^{15}$/cc

and $n_1 = 1.5 \times 10^{10}$/cc

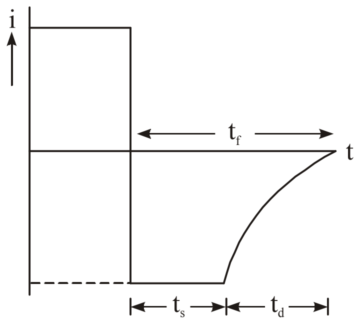
According to mass action low

$$np = n_i^2$$

$$n = \frac{n_i^2}{p} = \frac{(1.5 \times 10^{10})^2}{2.25 \times 10^{15}}$$

$$= 10^5 / cc$$

49. ***Ans. (c)***



Recovery time $t_r = t_s + t_d$

t_s = storage time (to remove stored minority carriers)

t_d = to bring the diode in reverse biase condition i.e. $V_D = V_R$) and current i = 0.

50. ***Ans. (d)***

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