1. Which of the following statements is incorrect ?

(1) Resistance of semiconductor decreases with increase in temperature

(2) In an electric field, displacement of holes is opposite to the displacement of electrons

(3) Resistance of a conductor decreases with the increase in temperature

(4) n-type semiconductors are neutral

2. Pick out the wrong one for the statement. The reverse current in p-n junction diode

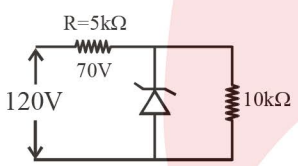
(1) is very small and constant

(2) remains constant even after the breakdown voltage

(3) becomes infinity at breakdown

(4) reverse current is controlled by external resistance

3. For the circuit shown in the figure:



(A) current through zener diode is 4 mA

(B) current through zener diode is 9 mA

(C) the output voltage is 50 V

(D) the output voltage is 40 V

Select the correct one

(1) A & D (2) A & C (3) B & D (4) B & C

4. Which of the following devices is heavily doped p-n junction comparitively ?

(1) Photo diode (2) Light emitting diode

(3) Solar cell (4) Zener diode

5. Which of the following statements is correct for proper working of zener diode ?

(1) Reverse bias voltage should be less than or equal to zener breakdown voltage

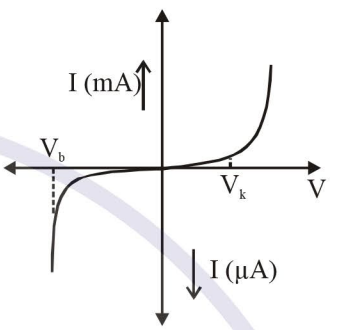
(2) Zener diode is to be reverse biased for zener action

(3) For given zener diode there can be different zener breakdown voltages

(4) All of above

6. The V-I characteristic for a p-n junction diode is plotted as shown in the figure. From the plot we can conclude that

[$V_b \rightarrow$ breakdown voltage, $V_k \rightarrow$ knee voltage]



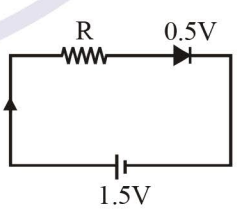
(1) the forward bias resistance of diode is very high; almost infinity for small values of V and after a certain value it becomes very low

(2) the reverse bias resistance of diode is very high in the beginning upto breakdown voltage is not achieved

(3) both forward and reverse bias resistances are same for all voltages

(4) both (1) and (2) are correct

7. The diode used in the circuit shown in the figure has a constant voltage drop of 0.5 V at all currents and a maximum power rating of 100 milliwatts. What should be the value of the resistor R connected in series with the diode for obtaining maximum current -



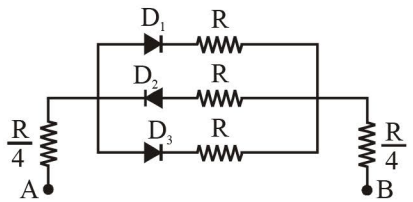
(1) 1.5 Ω

(2) 5 Ω

(3) 6.67 Ω

(4) 200 Ω

8. In the following circuits PN-junction diodes D_1, D_2 and D_3 are ideal for the following potential of A and B, the correct increasing order of resistance between A and B will be -



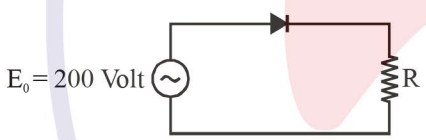
(i) –10V, –5V, (ii) –5V, –10V

(iii) –4V, –12V

(1) (i) < (ii) < (iii) (2) (iii) < (ii) < (i)

(3) (ii) = (iii) < (i) (4) (i) = (iii) < (ii)

9. A sinusoidal voltage of peak value 200 volt is connected to a diode and resistor R in the circuit shown so that half wave rectification occurs. If the forward resistance of the diode is negligible compared to R then rms voltage (in volt) across R is approximately -



(1) 200 (2) 100 (3) $\frac{200}{\sqrt{2}}$ (4) 280

10. The mobility of electrons and holes in a sample of instrinsic germanium at room temperature are 0.36 and 0.14 $m^2/V\text{-}s$. If electron and holes densities each are equal to $2.5 \times 10^{19}/m^3$ then conductivity of germanium will be (in ohm meter) :

(1) 2 (2) 4

(3) 6 (4) 8

11. In an N-P-N transistor, the collector current is 10 mA, if 80% emitted electrons reach the collector then :-

(1) the emitter current will be 7.5 mA

(2) the emitter current will be 12.5 mA

(3) the base current will be 3.5 mA

(4) the base current will be 1.5 mA

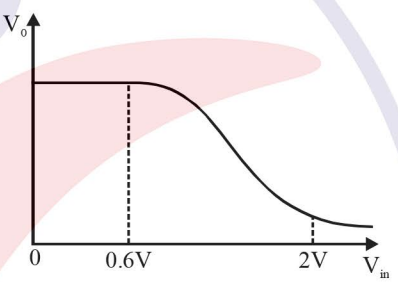
12. A common emitter amplifier is designed with NPN transistor ($\alpha = 0.99$). The input impedance is 1KΩ and load is 10 KΩ. The voltage gain will be

(1) 9.9 (2) 99 (3) 990 (4) 9900

13. In a common amitter transistor amplifier, when signal voltage changes by 0.01 volt, the base current changes by 10 μA and collector current changes by 1 mA. If the collector resistance $R_C = 4$ kΩ and load resistance $R_L = 8$ kΩ, then the current gain is

(1) 1 (2) 10 (3) 100 (4) 1000

14. Figure shows the transfer characteristics of a base biased CE transistor. Which of the following statements is **FALSE** ?



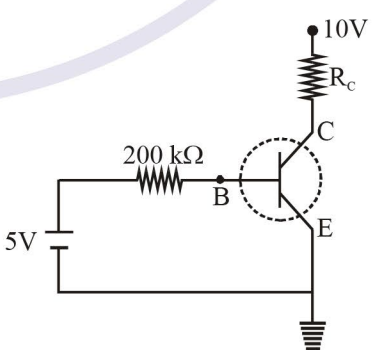
(1) At $V_i = 1V$, it can be used as an amplifier.

(2) At $V_i = 0.5V$, it can be used as a switch turned off.

(3) At $V_i = 2.5V$, it can be used as a switch turned on.

(4) At $V_i = 0.4V$, transistor is in active state.

15. In given transistor circuit at saturation mode $V_{BE} = 0.8V$, $V_{CE} = 0.2V$ and $\beta = 100$ then find the maximum value of R_C for which transister remains in saturation mode :



(1) 2.31 kΩ (2) 4.67 kΩ

(3) 5.32 kΩ (4) 6.24 kΩ

16. Three amplifiers X, Y and Z are connected in series. If the voltage gains of X, Y and Z are 10, 20 and 30 respectively and the input signal is 1 mV peak value. Then what is the output signal voltage peak value if dc supply voltage is 5V :-

(1) 4 V (2) 5 V

(3) 6 V (4) 7 V

17. Input waveforms A and B as shown in fig I are applied to the combination of gates as shown in Fig.II. Which of the waveforms shown in Fig. (i) to (iv) correctly represents the output waveform?

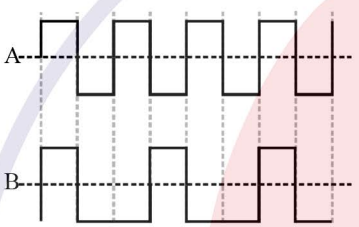


Fig. I

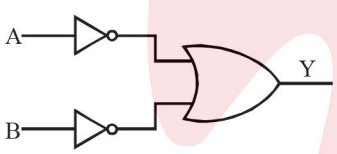


Fig-II

(1)

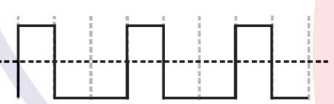


Fig. (i)

(2)

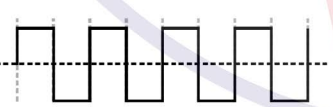


Fig. (ii)

(3)

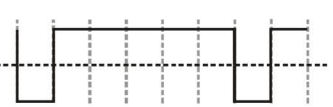


Fig. (iii)

(4)

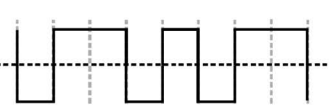


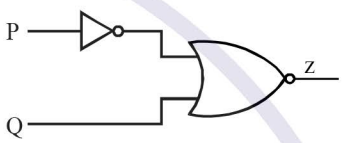
Fig. (iv)

18. A combination of logic gates has the truth table below.

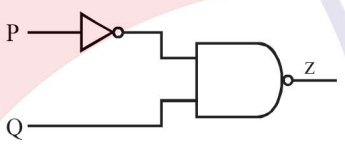
P	Q	Z
0	0	0
0	1	1
1	0	1
1	1	1

Which of the following combinations has this truth table ?

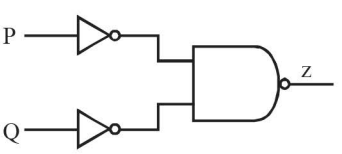
(1)



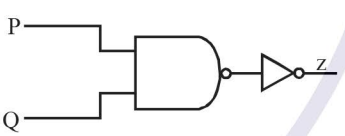
(2)



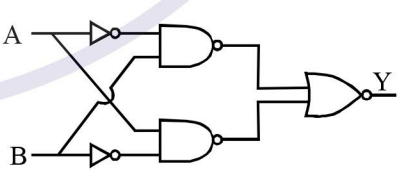
(3)



(4)



19. Output Y of the given logic gate network is :



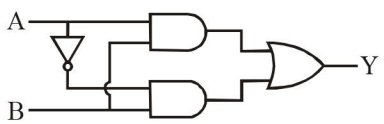
(1) $\bar{A}.B + A.\bar{B}$

(2) $A.B + \bar{A}.\bar{B}$

(3) $\left(\overline{A + B}\right) . \bar{A} . \bar{B}$

(4) None

20. Truth table for the given circuit is :-



(1)

A	B	Y
0	0	1
0	1	0
1	0	1
1	1	0

(2)

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	0

(3)

A	B	Y
0	0	0
0	1	1
1	0	0
1	1	1

(4)

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	1

21. Electromagnetic wave with frequencies greater than the critical frequency of ionosphere cannot be used for communication using sky wave propagation, because :-

(1) The refractive index of the ionosphere becomes very high for $f > f_C$

(2) The refractive index of the ionosphere becomes very low for $f > f_C$

(3) The refractive index of the ionosphere becomes very high for $f < f_C$

(4) None of these

22. A transmitting antenna of height 20m and the receiving antenna of height h are separated by a distance of 40 km for satisfactory communication in line of sight mode, then the value of h is :-

(1) 40m (2) 45m

(3) 30m (4) 25m

23. A ground receiver in line of sight communication can not receive direct waves due to :-

(1) its low frequency

(2) curvature of earth

(3) its high frequency

(4) smaller antenna

24. In modulation process :-

(1) Characteristic of carrier signal is varied in accordance with the instantaneous value of the message signal

(2) Characteristic of message signal is varied in accordance with the instantaneous value of the carrier signal

(3) Characteristic of carrier signal is varied in accordance with the average value of the message signal

(4) None of these

25. A carrier signal $60\sin(2\pi \times 10^6 t)$ is used to modulate audio signal $15\sin(300\pi t)$. The depth of modulation is :

(1) 50 % (2) 40%

(3) 25% (4) 15%

26. Total power of amplitude modulated wave is given by :-

(1) $\frac{V_m^2}{2R}\left[1+\frac{\mu^2}{2}\right]$

(2) $\frac{V_c^2}{2R}\left[1+\frac{\mu^2}{2}\right]$

(3) $\frac{V_c^2}{2R}\frac{\mu^2}{2}$

(4) $\frac{V_m V_C}{2R}\left[1+\frac{\mu^2}{2}\right]$

27. The diameter of a cylinder is measured using a Vernier callipers with no zero error. It is found that the zero of the Vernier scale lies between 5.10 cm and 5.15 cm of the main scale. The Vernier scale has 50 divisions equivalent to 2.45 cm. The 24^{th} division of the Vernier scale excatly coincides with one of the main scale divisions. The diameter of the cylinder is :-

(1) 5.112 cm

(2) 5.124 cm

(3) 5.136 cm

(4) 5.148 cm

28. Consider a Vernier callipers in which each 1 cm on the main scale is divided into 8 equal divisions and a screw gauge with 100 divisions on its circular scale. In the Vernier callipers, 5 divisions of the Vernier scale coincide with 4 divisions on the main scale and in the screw gauge, one complete rotation of the circular scale moves it by two divisions on the linear scale. Then :

(1) If the pitch of the screw gauge is twice the least count of the Vernier callipers, the least count of the screw gauge is 0.01 mm.

(2) If the pitch of the screw gauge is twice the least count of the Vernier callipers, the least count of the screw gauge is 0.005 mm.

(3) If the least count of the linear scale of the screw gauge is twice the least count of the Vernier callipers, the least count of the screw gauge is 0.01 mm.

(4) If the least count of the linear scale of the screw gauge is twice the least count of the Vernier callipers, the least count of the screw gauge is 0.005 mm.

29. When the gap is closed without placing any object in the screw gauge whose least count is 0.005 mm, the 5^{th} division on its circular scale coincides with the reference line on main scale, and when a small sphere is placed reading on main scale advances by 4 divisions, whereas circular scale reading advances by five times to the corresponding reading when no object was placed. There are 200 divisions on the circular scale. The radius of the sphere is

(1) 4.10 mm (2) 4.05 mm

(3) 2.10 mm (4) 2.05 mm

30. A vernier callipers having 1 main scale division = 0.1 cm is designed to have a least count of 0.02 cm. If n be the number of divisions on vernier scale and m be the length of vernier scale, then :-

(1) n = 10, m = 0.5 cm

(2) n = 9, m = 0.4 cm

(3) n = 10, m = 0.8 cm

(4) n = 10, m = 0.2 cm

ANSWER KEY Exercise-I

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	**3**	**2**	**4**	**4**	**2**	**4**	**2**	**3**	**2**	**1**
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	**2**	**3**	**3**	**4**	**2**	**3**	**3**	**3**	**4**	**3**
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	**1**	**2**	**2**	**1**	**3**	**2**	**2**	**2,3**	**4**	**3**