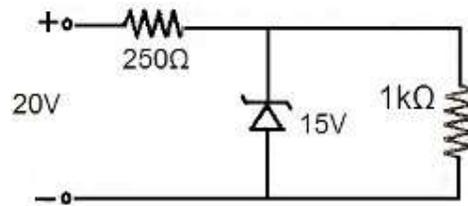


## Semiconductors

1. In an n-p-n transistor circuit, the collector current is 9 mA. If 90% of the electrons emitted reach the collector. Then the emitter current is  
a) 8.1 mA      b) 8 mA      c) 10 mA      d) 9 mA
2. A transistor has an  $\alpha=0.95$ , it has change in emitter current of 100 mA then the change in the collector current is  
a) 95 mA    b) 99.05 mA    c) 100.95 mA    d) 100 mA
3. A transistor has  $\alpha=0.95$ , then  $\beta$  is equal to...  
a) 1/19    b) 19    c) 1.5    d) 0.95
4. In p-type semiconductor germanium is doped with  
a) Aluminium    b) boron    c) gallium    d) all of these
5. The logic behind NOR gate is that which gives  
a) High output when both inputs are high  
b) low output when both inputs are low  
c) high output when both inputs are low  
d) none of these
6. For an n-p-n transistor circuit, the collector current is 10mA. IF 90% of the electron emitted reach the collector then  
a) the base current will be 1.1 mA  
b) the base current will be 10mA  
c) the base current will be 11 mA  
d) the emitter current will be 9 mA
7. The depletion layer in the p-n junction region is caused by  
a) Drift of holes    b) diffusion of charge carriers  
c) migration of impurity ions    d) drift of electrons
8. In n-p-n transistor circuit, the collector current is 5mA. If 98% of electrons emitted reach the collector then the emitter current will be..  
a) 8.1 ma      b) 5.1 mA    c) 10 mA    d) 5 mA
9. When n-type semiconductor is heated..  
a) number of electrons increases while that of holes decreases  
b) number of holes increases while that of electrons decreases  
c) number of electrons and holes remain same  
d) number of electrons and holes increases equally
10. For a common emitter circuit if  $I_C / I_E=0.98$  then current gain for common emitter circuit will be..  
a) 49      b) 98    c) 4.9    d) 25.5
11. If a full wave rectifier circuit is operating from 50Hz mains, the frequency of output will be..  
a) 100 Hz      b) 25 Hz    c) 50 Kz    d) 70.7Hz

12. A zener diode, having breakdown voltage equal to 15V, is used in a voltage regulator circuit shown in figure. The current through the diode is



- a) 10mA      b) 15mA      c) 20mA      d) 5mA

13. Pure Si at 500K has equal number of electrons ( $n_e$ ) and holes ( $n_h$ ) concentration of  $1.5 \times 10^{16} \text{ m}^{-3}$ . Doping by Indium increases  $n_h$  to  $4.5 \times 10^{22} \text{ m}^{-3}$ . The doped semiconductor is of

- a) n-type with electron concentration  $n_e = 5 \times 10^{22} \text{ m}^{-3}$   
 b) p-type with electron concentration  $n_e = 2.5 \times 10^{10} \text{ m}^{-3}$   
 c) n-type with electron concentration  $n_e = 2.5 \times 10^{23} \text{ m}^{-3}$   
 d) p-type having electron concentration  $n_e = 5 \times 10^9 \text{ m}^{-3}$

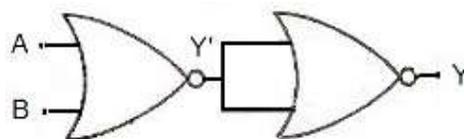
14. An n-p-n transistor conducts when..

- a) both collector and emitter are negative with respect to the base  
 b) both collector and emitter are positive with respect to the base  
 c) collector is positive and emitter is negative with respect to the base  
 d) collector is positive and emitter is at same potential as the base.

15. A transistor is operated in common emitter configuration at  $V_C = 2\text{V}$  such that a change in the base current from  $100 \mu\text{A}$  to  $300 \mu\text{A}$  produces a change in the collector current from  $10\text{mA}$  to  $20\text{mA}$ . The current gain is

- a) 50      b) 75      c) 100      d) 25

16. In the following circuit, the output Y for all possible inputs A and B is expressed by the truth table..



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

a)

17. A common emitter amplifier has a voltage gain of 50, an input impedance of  $100 \Omega$  and an output impedance of  $200 \Omega$ . The power gain of the amplifier is

- a) 1000      b) 1250      c) 100      d) 500

18. A transistor is operated in common emitter configuration at constant collector voltage  $V_C = 1.5\text{V}$  such that a change in the base current from  $100 \mu\text{A}$  to  $150 \mu\text{A}$  produces a change in the collector

current from 5mA to 10mA. The current gain ( $\beta$ ) is

- a) 75      b) 100      c) 50      d) 67

19. A p-n photodiode is fabricated from a semiconductor with a band gap of 2.5eV. It can detect a signal of wavelength

- a) 4000 nm      b) 6000 nm      c) 4000Å      d) 6000Å

20. In semiconductors, at room temperature

- a) the conduction band is completely empty  
b) the valence band is partially empty and conduction band is completely filled  
c) the valence band is partially empty and the conduction band is partially filled  
d) the valence band is completely filled

21. Barrier potential of p-n junction diode does not depend on

- a) doping density      b) diode design      c) temperature      d) forward bias

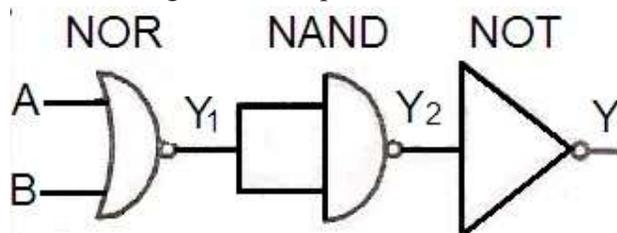
22. In p-n junction photocell, the value of the photo-electromotive force produced by monochromatic light is proportional to

- a) voltage applied at the p-n junction      b) the barrier voltage at the p-n junction  
c) intensity of the light falling on the cell      d) frequency of the light falling on the cell

23. A piece of copper and other of germanium are cooled from room temperature to 80K, then,,

- a) resistance of each will increase      b) resistance of copper will decrease  
c) resistance of copper will increase while that of germanium will decrease  
d) resistance of copper will decrease while that of germanium will increase

24. The following circuit is equivalent to

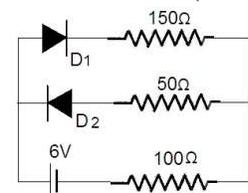


- a) AND gate      b) NAND gate      c) NOR gate      d) OR gate

25. The electrical conductivity of a semiconductor increases when EM radiation of wavelength shorter than 2480 nm is incident on it. The band gap ( in ev) for the semiconductor is

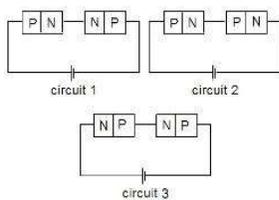
- a) 0.9      b) 0.7      c) 0.5      d) 1.1

26. The circuit shown in the figure contains two diodes each with a forward resistance of 50Ω and with infinite backward resistance. If the battery voltage is 6V, the current through the 100Ωresistnce ( in amperes) is



- a) zero      b) 0.02      c) 0.03      d) 0.036

27. The part of transistor which is most heavily doped to produce large number of majority carriers  
 a) Emitter            b) base            c) collector    d) can be any of the above three
28. In the middle of the depletion layer of reverse-biased p-n junction, the  
 a) Electric field is zero            b) potential is maximum  
 c) electric field is maximum    d) potential is zero
29. When npn transistor is used as amplifier  
 a) electrons move from collector to base            b) holes moves from emitter to base  
 c) electrons move from base to collector            d) holes move from base to emitter
30. In common emitter amplifier, the phase difference between the input signal voltage and output voltage is  
 a)  $\pi$             b)  $\pi/4$             c)  $\pi/2$             d) 0
31. If the ratio of the concentration of electrons to that of holes in a semiconductor is  $7/5$  and the ratio of current is  $7/4$ , then what is the ratio of their drift velocities  
 a)  $5/8$             b)  $4/5$             c)  $5/4$             d)  $4/7$
32. In a common base transistor circuit, the current gain is 0.98. On changing emitter current by 5.0mA, the change in collector current is  
 a) 0.196 mA            b) 2.45 mA            c) 4.9 mA            d) 5.1 mA
33. What is the voltage gain in a common emitter amplifier, where input resistance is  $3\Omega$  and load resistance is  $24\Omega$ ,  $\beta = 0.6$   
 a) 8.4            b) 4.8            c) 2.4            d) 480
34. The probability of electrons to be found in the conduction band of an intrinsic semiconductor at a finite temperature  
 a) decreases exponentially with increasing band gap  
 b) increases exponentially with increasing band gap  
 c) decreases exponentially with increasing temperature  
 d) is independent of the temperature and band gap
35. Two identical p-n junctions may be connected in series with battery in three ways as shown in the adjoining figure. The potential drop across the p-n junctions are equal in

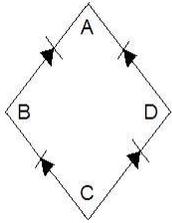


- a) Circuit 1 and Circuit 2  
 b) circuit 2 and circuit 3  
 c) circuit 3 and circuit 1  
 d) circuit 1 only

36. The level formed due to impurity atom, in the forbidden energy gap, very near to the valence band in a P-type semiconductor is called

- a) An acceptor level      b) A donor level      c) A conduction level      d) A forbidden level

37. Figure shows a full wave bridge rectifier circuit. The input a.c. is connected across



- a) A and C      b) B and D      c) A and B      d) C and B

38. Read the following statements carefully:

Y : The resistivity of a semiconductor decreases with increase of temperature

Z: In a conducting solid, the rate of collisions between free electrons and ion increases with increase of temperature

select the correct statement from the following:

- a) Y is true but Z false      b) Y is fals but Z is true  
c) Both Y and Z are true      d) Y is true and z is correct reason for Y

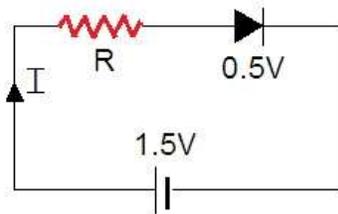
39. In a common-base amplifier circuit, calculate the change in base current if that in the emitter current is 2mA and  $\alpha = 0.98$

- a) 0.04mA      b) 1.96 mA      c) 980      d) 2 mA

40. In p-n junction, avalanche current flows in circuit when biasing is

- a) Forward      b) Reverse      c) zero      d) Excess

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



- a) 5  $\Omega$       b) 5.6  $\Omega$       c) 6.67  $\Omega$       d) 20  $\Omega$

42. In an p-n-p transistor working as a common base amplifier current gain is 0.96 and emitter current is 7.2mA. The base current is

- a) 0.2 mA      b) 0.29 mA      c) 0.35 mA      d) 0.4 mA

**KEY**

1. C 2.A 3.B 4.D 5. C 6.A 7.B 8.B 9.D 10.A 11.A 12.D 13.D 14.C 15.A 16.C 17.B  
18.B 19.C 20.C 21.B 22.C 23.D 24.C 25.C 26.B 27.A 28.C 29.D 30.A 31.C 32.C 33.B 34.A  
35.B 36.A 37.B 38.C 39.A 40.B 41.A 42.B