1. A 75 MHz carrier having an amplitude of 50 V is produced by a 3 KHz audio signal having an amplitude of 20 V. The expression for carrier wave is V_c =

(A) $50\sin 150\times10^{6}\,pt$ (B) $75\sin 150\times10^{3}\,pt$ (C) $75\sin 300\times10^{6}\,pt$ (D) $25\sin 150\times10^{6}\,pt$

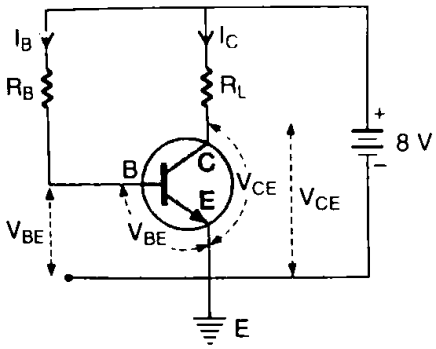
2. How many 600KHz waves can be a 5 miles transmission line simultaneously? (Take speed of light to be 186000 miles per second)

(A) 16.13 (B) 8.07 (C) 32.26 (D) None

3. A semiconductor has an electron concentration of $0.45\times10^{12}m^{-3}$ and a hole concentration of $5\times10^{20}m^{-3}$. Calculate its conductivity. Given mobility = $0.135\,m^2v^{-1}s^{-1}$, hole mobility = $0.048\ m^2v^{-1}s^{-1}$.

(A) $13.21\,sm^{-1}$ (B) $3.84\ sm^{-1}$ (C) $6.72\ sm^{-1}$ (D) $18.64\ sm^{-1}$

4. An N-P-N transistor in a common emitter mode is used as a simple voltage amplifier with a collector current of 4mA. The terminal of a 8V battery is connected to the collector through a load resistance R_L and to the base through a resistance R_B. The collector-emitter voltage V_{CE} = 4V , base-emitter voltage V_{BE} = 0.6 V and base current amplification factor $B_{ac}=100$. Find the value of R_B .



(A) 390 kW (B) 1200 kW

(C) 324 kW (D) 185 kW

5. The electric field component of a plane E.M wave travelling in vacuum is given by $E(z,t)=E_o\cos(kz-wt)\,\hat{i}$. The pointing vector for the wave is $\vec{s}$ =

(A) $C\epsilon_0 E_0^2\cos(kz-wt)\,\hat{k}$ (B) $C\,\epsilon_0\,E_0^2\cos(kz-wt)\,\hat{j}$

(C) $C\,\epsilon_0\,E_0^2\cos(kz-wt)\,\hat{i}$ (D) None

6. The magnetic field associated with the electric filed vector $\vec{E}=E_0\cos(kz-wt)\hat{i}$ is $\vec{B}$ =

(A) $\frac{E_0}{C}\sin(kz-wt)\hat{i}$ (B) $\frac{E_0}{C}\cos(kz-wt)\hat{j}$ (C) $\frac{E_0}{C}\cos(kz-wt)\hat{k}$ (D) $\frac{E_0}{C}\cos(kz-wt)\hat{i}$

7. A plane electromagnetic wave in the visible region is moving along the direction. The frequency of the wave is 10^{15} Hz and the electric field at any point is varying sinusoidally with an amplitude 0.5 V/m . Find average values of the densities of electric and magnetic fields.

(A) $0.55\times10^{-12}\,J/m^2;0.55\times10^{-12}\,J/m^2$ (B) $1.10\times10^{-12}\,J/m^2;0.55\times10^{-12}\,J/m^2$

(C) $1.10\times10^{-12}\,J/m^2;1.10\times10^{-12}\,J/m^2$ (D) $1.10\times10^{-12}\,J/m^2;0.55\times10^{-12}\,J/m^2$

8. Find the varying voltage between the plates in 10^6 V/m to establish an instantaneous displacement current of 4A in space between the two parallel plates of 2mF capacitor.

(A) 2 (B) 4 (C) 3 (D) 8

9. In a semiconductor diode, the barrier potential offers opposition to
(A) holes in p region only (B) Free electrons in n-region only
(C) majority carries in both regions (D) majority as well as minority carriers in both regions

10. Transistor working as an amplifier operates in its active region of characteristics only when
(A) The emitter junction is forwarded biased and the collector junction is reverse biased
(B) The emitter junction is reverse biased
(C) The collector junction is forwarded biased
(D) The emitter junction is reverse biased and the collector junction is forwarded biased

11. A paramagnetic material sample shows a net magnetisation of $8\ Am^{-1}$ when placed in an external magnetic field of 0.6 T. at a temperature of 4K. When the same sample is placed in an external magnetic field of 0.2 T at a temperature of 16K, the magnetisation will be
(A) $\frac{32}{3} Am^{-1}$ (B) $\frac{2}{3} Am^{-1}$ (C) $6\,Am^{-1}$ (D) $2.4\,Am^{-1}$

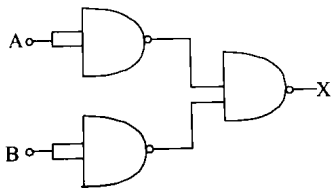
12. In a permanent magnet at room temperature
(A) Magnetic moment of each molecule is zero
(B) The individual molecules have non-zero magnetic moment which are all perfectly aligned
(C) domains are partially aligned
(D) domains are perfectly aligned

13. Light with an energy flux of $20\,w/cm^2$ falls on a non-reflecting surface at normal incidence. If the surface has an area of $30\,cm^2$, the total momentum delivered for complete absorption during 30 min is
(A) $36 \times 10^{-5}\,kgms^{-1}$ (B) $36 \times 10^{-4}\,kgms^{-1}$ (C) $108 \times 10^{4}\,kgms^{-1}$ (D) $1.08 \times 10^{7}\,kgms^{-1}$

14. The electric field intensity produced by the radiation coming from 100 W bulb at a 3 m distance is E. The electric field intensity produced by the radiations coming from 50 W bulb at the same distance is
(A) $\frac{E}{2}$ (B) 2E (C) $\frac{E}{\sqrt{2}}$ (D) $\sqrt{2}E$

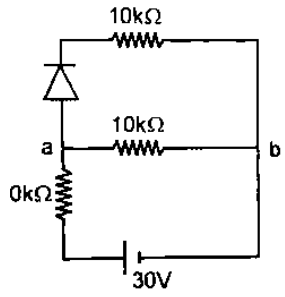
15. For LED's to emit light in visible region of electromagnetic light, it should have energy band in the range of
(A) 0.1 eV to 0.4 eV (B) 0.5 eV to 0.8 eV (C) 0.9 eV to 1.6 eV (D) 1.7 eV to 3.0 eV

16. The combination of gates shown yields
(A) OR gate (B) NOT gate
(C) XOR gate (D) NAND gate

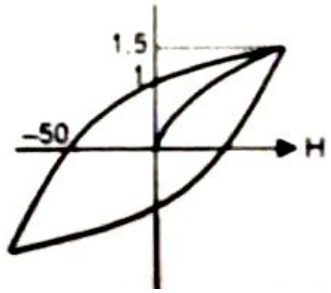


17. A screw gauge advances by 3mm in 6 rotations. There are 50 divisions on circular scale. Find least count of screw gauge
(A) 0.002 cm (B) 0.001 cm (C) 0.01 cm (D) 0.02 cm

18. There is an electric circuit as shown in the figure. Find potential difference between points a and b.
(A) 0 V (B) 15 V (C) 10 V (D) 5 V

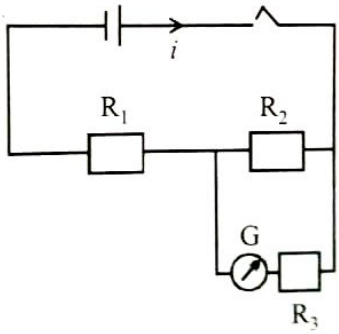


19. The hysteresis curve for a material is shown in the figure. Then, for the material retentivity, coerceivity and saturation magnetisation respectively are? Take external field H on X-axis and magnetisation I on Y- axis



(A) 50 A/m, 1 T, 1.5 T
(B) 1.5 T, 50 A/m, 1 T
(C) 1 T, 50 A/m, 1 T
(D) 50 A/m, 1.5 T, 1 T

20. To find the resistance of galvanometer by the half deflection method, the following circuit is used with resistances $R_1 = 9970\ \Omega$, $R_2 = 30\ \Omega$ and $R_3 = 0$. The deflection in the galvanometer is d with $R_3 = 107\ \Omega$, the deflection changed to $\frac{d}{2}$. The galvanometer resistance is approximately.

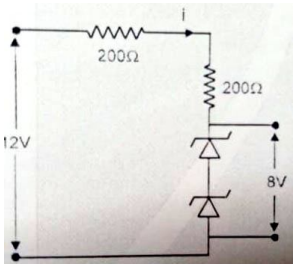


(A) $107\ \Omega$ (B) $137\ \Omega$

(C) $\frac{107}{2}\ \Omega$ (D) $77\ \Omega$

21. To determine refractive index of glass slab using a travelling microscope, minimum number of reading required are

22. Find the power loss in each diode (in mw) if potential drop across the zener diode is 8 V.



23. A spectrometer gives the following reading when used to measure the angle of prism.
Main scale regarding : 58.5 degree
Vernier scale reading : 09 divisions
Given that 1 division on main scale corresponds to 0.5 degree. Total divisions on the vernier scale is 30 and match with 29 divisions of the main scale. The angle of the prism from the above data is

24. A transmitting antenna at the top of a tower has height 32 m and height of the receiving antenna is 50 m. What is the maximum distance between them for satisfactory communication in line of sight (LOS) mode (in km)

25. A radar has a power of 1 KW and is operating at a frequency of 10 GHz. It is located on a mountain top of height 500 m. The maximum distance up to which it can detect object located on the surface of the earth (in km) is (Radius of earth = 6400 km)

KEY

1.	A	2.	A	3.	B	4.	D	5.	A
6.	B	7.	A	8.	A	9.	C	10.	A
11.	B	12.	D	13.	A	14.	A	15.	D
16.	A	17.	B	18.	C	19.	D	20.	D
21.	3	22.	40	23.	58.65	24.	45.5	25.	80