2020 - physics - Tentative answer key

PART

B

Part I

1. (c) Space wave propagation

2. (d) $Q/\sqrt{2}$ $\quad U_E = \frac{U}{2}$

$$\frac{Q'^2}{2C} = \frac{1}{2}\cdot\frac{Q^2}{2C}$$

ie $(Q')^2 = \frac{Q^2}{2}$

ie $Q' = \frac{Q}{\sqrt{2}}$

3. a. GaInN

4. d. $\sqrt{\frac{2q^3B^2V}{m}}$ (Book - Back)

5. (b) 0.2 A (current in the capacitor is due to displacement current only)

6. (c) decreases $\left(V_n = \frac{h}{2\pi ma}\cdot\frac{Z}{n}\right)$ $\left(V \propto \frac{1}{n}\right)$

7. (b) Zero. (Two points are lie in the equipotential)

8. (b) $A^{2/3}$ $\quad R = r_0 A^{1/3}$

Area $= \pi R^2$

$= \pi r_0^2 A^{2/3}$

9) d. 2:1 (CBSE Question)

$[I = 2I_0(1+\cos\phi)$

$\phi_P = 0;\ \phi_Q = \frac{2\pi P}{\lambda} = \frac{2\pi}{\lambda}\cdot\frac{\lambda}{4}$

ie $\phi_Q = \frac{\pi}{2}$

ie $\frac{I_P}{I_Q} = \frac{1+\cos\phi_P}{1+\cos\phi_Q} = \frac{1+\cos 0}{1+\cos 90}$

10. (c) 10 cm (Book back)

11. (b) OR gate

12. (d) $\frac{1}{R}$ $\quad B = \frac{\mu_0 I}{2\pi R}$

13. (d) C remains the same, Q doubled.

$Q \propto V$ ie $V' = 2V$ then $Q' = 2Q$

But $C = \frac{Q}{V}$; $C' = \frac{2Q}{2V} = C$

14. d. 1.24 eV (Book back)

15. d. 3A $\quad R_{eq} = \frac{R}{n}$

$= \frac{15}{3} = 5\,\Omega$

$I = V/R = \frac{15}{5} = 3\,A$

Q.No: 18

$N_P = 460;\ N_S = 40{,}000$

$V_P = 230\,V;\ V_S = ?$

For an Ideal transformer

$$\frac{N_P}{N_S} = \frac{V_P}{V_S}$$

ie $V_S = \frac{N_S}{N_P} \times V_P$

$= \frac{40000}{460} \times 230$

$V_S = 20{,}000\,V$

Voltage per turn is

$V_S/\text{turn} = \frac{20{,}000}{40{,}000} = 0.5\,V$

23) Book - page NO: 152

The Susceptibility of material X is

$\chi_m(x) = \left|\frac{\vec{M}}{\vec{H}}\right| = \frac{500}{1000} = 0.5$

$\chi_m(Y) = \left|\frac{\vec{M}}{\vec{H}}\right| = \frac{2000}{1000} = 2$

Since χ_m of Y is greater than X, material Y can be easily magnetised

24. Resolving power of a microscope is inversely proportional to the wave length

ie $r_0 \propto \frac{1}{\lambda}$

~~De~~ de-Broglie wavelength of an electron is very less comparable with X rays.

26) $R_t = R_0(1+\alpha t)$

$R_0 = 10\Omega, \alpha = 0.004/°C, t = 100°C$

$R_t = 10(1+0.004\times100)$

$= 10(1+0.4) \Rightarrow 14\Omega$

28) Book - page NO: 219

$I_B = \frac{V_i}{R_B} = \frac{20}{500\times10^3} = 4\times10^{-5}A$

$I_C = \frac{V_{CC}}{R_C} = \frac{20}{4\times10^3} = 5mA$

$\beta = \frac{I_C}{I_B} = 125$

33)

- The process modulation using high frequency carrier waves.
- While we are using high frequency carrier wave the height of the antenna becomes small.
- ie $H = \frac{\lambda}{4}$

For example

if we are sending the wave of 100 KHz, the wavelength is $\lambda = \frac{c}{\nu} = \frac{3\times10^8}{100\times10^3}$

$= 3000\,m$

So the height of the antenna to be 750 m.

But if we send through 100 MHz

then $\lambda = 3\,m$

which require only 0.75 m.

36) Given $E_n = $ ~~3~~ $-3.4\,eV$

W.k.t $E_n = \frac{-13.6}{n^2}\,eV$

ie $n^2 = \frac{-13.6}{-3.4} = 4$

$\boxed{n = 2}$

Angular momentum $L = \frac{nh}{2\pi}$

ie $L = \frac{2\times6.6\times10^{-34}}{2\times3.14}$

$\boxed{L = 2.10\times10^{-34}\,kgm^2s^{-1}}$