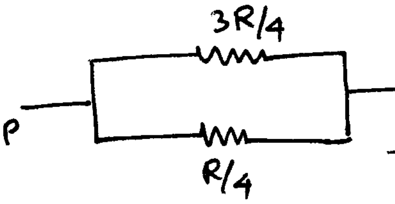
Marking scheme, 1st Semester Exam - 2016

21/9/16

Subject - PHYSICS - XII.

Q.1



→ $\left(\frac{1}{2}\right)$

$\therefore R_{PS} = \dfrac{\frac{3R}{4} \times \frac{R}{4}}{R} = \dfrac{3R}{16}$ → $\left(\frac{1}{2}\right)$ } $\frac{1}{2}+\frac{1}{2}$.

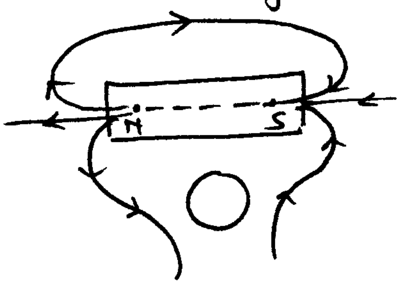
Q2 (i) Transformer core/Magnets — $\left(\frac{1}{2}\right)$
(ii) superconductors ——— $\left(\frac{1}{2}\right)$ } $\frac{1}{2}+\frac{1}{2}$

Q3 $\oint \vec{E}\cdot\vec{ds} = \dfrac{q}{\epsilon_0} + \oint \vec{B}\cdot\vec{ds} = 0 + \int \vec{E}\cdot\vec{dl} = -\dfrac{d\phi_B}{dt}$ } $\frac{1}{2}+\frac{1}{2}$ or

⇓

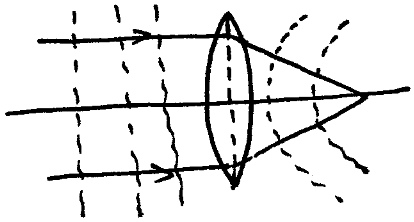
$\oint \vec{B}\cdot\vec{dl} = \mu_0\left[I_c + \epsilon_0 \dfrac{d\phi_E}{dt}\right]$ ———→ 1.

Q4



——— 1.

Q5



——— 1.

Q6 Unit of Resistivity $= \sigma = \dfrac{A^2 s}{N m^2}$ or $\Omega^{-1} m^{-1}$ or Simen m^{-1}. $\left(\frac{1}{2}\right)$ } $\frac{1}{2}+1\frac{1}{2}$.

Deriv^n of $V_d = \dfrac{I}{neA}$ ——— $\left(1\frac{1}{2}\right)$

Q7 (i) Device A → capacitor —— $\frac{1}{2}$
" B → Inductor —— $\frac{1}{2}$
(ii) $X_c = \dfrac{1}{\omega C}$ ⇒ As $\omega\downarrow$, $X_c\uparrow$ and $i\downarrow$ — $\frac{1}{2}$
$X_L = \omega L$ ⇒ As $\omega\downarrow$, $X_L\downarrow$ and $i\uparrow$ — $\frac{1}{2}$ } $\frac{1}{2}+\frac{1}{2}+\frac{1}{2}+\frac{1}{2}$

Q8 (i) $c = \dfrac{E_0}{B_0}$ ——— (1) (ii) $c = \dfrac{1}{\sqrt{\mu_0\epsilon_0}}$ —— (1) } 1+1.

Q9 $B_0 = 2\times10^{-7}$ T, $K = 0.5\times10^3 = \dfrac{2\pi}{\lambda}$, $\omega = 1.5\times10^{11}$

$\therefore \lambda = \dfrac{2\pi}{0.5\times10^3}$ — $\left(\frac{1}{2}\right)$ & $\nu = \dfrac{1.5\times10^{11}}{2\pi}$ — $\left(\frac{1}{2}\right)$ } $\frac{1}{2}+\frac{1}{2}$

$\dfrac{E_0}{B_0} = \dfrac{\omega}{K} = \dfrac{1.5\times10^{11}}{0.5\times10^3} = 3\times10^8$ — $\left(\frac{1}{2}\right)$ $\therefore E_0 = B_0\times c = 3\times10^8\times2\times10^{-7} = 60$

$\therefore$ eq^n $E = 60\sin(0.5\times10^3 x + 1.5\times10^{11} t)$ ——— $\left(\frac{1}{2}\right)$ } $\frac{1}{2}+\frac{1}{2}$

Q10

At surface AC.

$i = 0, \ r = 0$

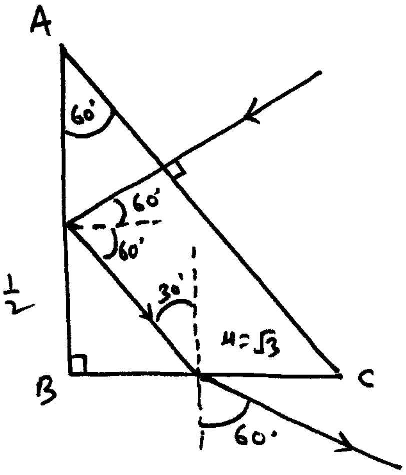
At surface AB

$i = 60°$

$\sin i_c = \frac{1}{\sqrt{3}} \Rightarrow i_c < 60°$

TIR will takes place

} $\frac{1}{2}+\frac{1}{2}$



At surface BC A/c Snell's law

$\sqrt{3} \sin 30 = 1 \times \sin r \Rightarrow \sin r = \frac{\sqrt{3}}{2} \therefore \boxed{r = 60°}$ } 1

Q10 OR

$u = -30\text{ cm}, \quad v = ? \quad f = +20\text{ cm}$

A/c lens formula $\frac{1}{v} - \frac{1}{-30} = \frac{1}{20}$ } 1.

$\therefore \frac{1}{v} = \frac{1}{60} \Rightarrow v = 60\text{ cm}$

$m = \frac{v}{u} = \frac{60}{-30} = -2 \quad \therefore$ Coordinate of image $= (60, -1.5)$ } 1.

Q11 (i) $X_L = \omega L = 2\pi \nu L \quad \therefore \nu = \frac{10}{2\pi \times 500} = \frac{1}{100\pi}\text{ Hz}$ } – $1\frac{1}{2}$

(ii) At $\nu = 300\text{ Hz}, \ X_L = 6\,\Omega$ & $R = 8\,\Omega$

$\therefore Z = \sqrt{(X_L)^2 + (R)^2} = \sqrt{36+64} = 10\,\Omega$ } $1\frac{1}{2}$

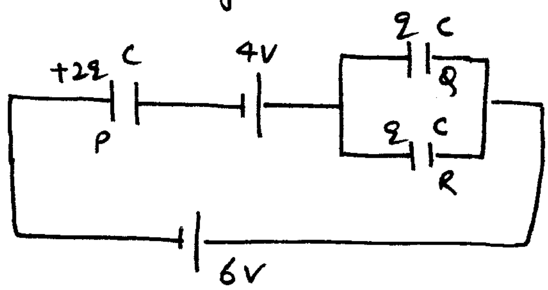
Q12 Diag^m of wheatstone bridge – (1)

Deri'v^n of balance wheatstone bridge – 2 } 1+2.

Q13

$6 - \frac{q}{c} - 4 - \frac{2q}{c} = 0$

$\Rightarrow 2 - \frac{3q}{c} = 0 \Rightarrow q = \frac{2c}{3}$ } 2



Charge on Q & R $= \frac{2c}{3}$, Charge on P $= \frac{4c}{3}$

$U = \frac{1}{2} C_{eq} (V)^2 = \frac{1}{2} \times \frac{2c}{3} \times (2)^2 = \frac{4c}{3}$ joule – (1)

} 2+1.

Q14

Defⁿ —— 1.
Method of prodⁿ —— 1.
" " reduction — 1.
} 1+1+1.

Q15

Diagm of lens maker formula — $\frac{1}{2}$
Derivation —— $2\frac{1}{2}$
} $\frac{1}{2}+2\frac{1}{2}$

Q16

$l = 200$ cm, $R = 10\Omega$

Current in AB $= \frac{3}{15} = \frac{1}{5}$ amp } 1

$V_A - V_B = \frac{1}{5}\times 10 = 2$ Volt —— 1.

$K = \frac{2}{200} = \frac{1}{100}$ V/cm —— 1.

$\because 1.2 = KL \Rightarrow L = \frac{1.2}{\frac{1}{100}} = 1.2\times 100 = 120$ cm } 1

} 1+1+1.

Q17

$R_1 = \frac{\rho l_1}{A_1}$ & $R_2 = \frac{\rho l_2}{A_2} \Rightarrow \frac{R_2}{R_1} = \frac{l_2}{l_1}\times\frac{A_1}{A_2}$

$\because A_1 l_1 = A_2 l_2 \Rightarrow \frac{A_1}{A_2} = \frac{l_2}{l_1} = 3$ } 1.

$\therefore R_2 = 9R_1 = 9R$

$\because l_1 : l_2 = 1:2 \Rightarrow R_1' = 3R$ & $R_2' = 6R$ } 2

$R_{net} = \frac{3R\times 6R}{9R} = 2R$

} 1+2.

Q18

$\because V = \frac{1}{4\pi\epsilon_0}\cdot\frac{q}{r} \Rightarrow q = 4\pi\epsilon_0 r V$

$q_{net} = Nq$ } 1

$V' = \frac{1}{4\pi\epsilon_0}\cdot\frac{Nq}{R}$ —— (A)

$\because \frac{4}{3}\pi R^3 = N\times\frac{4}{3}\pi r^3 \Rightarrow R = N^{\frac{1}{3}}\cdot r$

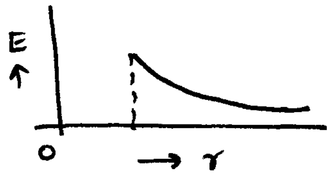
for eqⁿ (A) $V' = \frac{1}{4\pi\epsilon_0}\cdot\frac{N\,4\pi\epsilon_0 r V}{r N^{1/3}}$ } 2

$V' = (N^{\frac{2}{3}})\cdot V$

} 1+2.

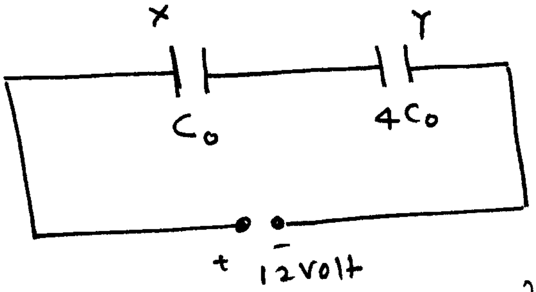
Q19. Deriv^n —— $2\frac{1}{2}$

Graph —— $\frac{1}{2}$



} $2\frac{1}{2}+\frac{1}{2}$

Q20



(i) $C_{eq} = \frac{C_o \times 4C_o}{C_o + 4C_o} = \frac{4C_o}{5}$

$4 = \frac{4C_o}{5} \Rightarrow C_o = 5\,\mu F$ — 1

$\therefore C_x = 5\,\mu F$ & $C_y = 20\,\mu F$

(ii) $V_x = \frac{4}{5} \times 12 = \frac{48}{5}$ volt & $V_y = \frac{1}{5} \times 12 = \frac{12}{5}$ volt } 1.

(iii) $\frac{U_x}{U_y} = \frac{\frac{1}{2} C_o V_x^2}{\frac{1}{2} 4C_o V_y^2} = \frac{\left(\frac{48}{5}\right)^2}{4 \times \left(\frac{12}{5}\right)^2} = 4$ } — 1

} 1+1+1.

Q21 (i) In-to the plane of paper —— 1.

(ii) $qE = qvB \Rightarrow v = \frac{E}{B}$ —— 1.

(iii) $r = \frac{mv}{qB}$ $\because B' = nB \Rightarrow r' = \frac{r}{n}$ — 1

} 1+1+1.

Q22 Current sensitivity $= \frac{NAB}{K}$ & Voltage sensitivity $= \frac{NAB}{KR_g}$

(i) Ratio of current sensitivity = 5:7

(ii) Ratio of voltage sensitivity = 1:1

} 1+1+1.

Q23 (i) Two qualities —— 1+1.

(ii) Electromagnetic Induction — 1.

(iii) $1000 \times 10 \times 40 \times \frac{80}{100} = 32 \times 10^4 = 3.2 \times 10^5\,W$ — 1

} 1+1+1+1.

Q24 $f_o = 4$ cm, $f_e = 8$ cm } 1.

Ray diag^m —— 2

Derivation —— 2

} 1+2+2

OR

For Convex lens $u = -15$, $f = 10$ cm

$\frac{1}{10} = \frac{1}{v} + \frac{1}{15}$ $\therefore v = 30$ cm } — 1.

Q.24 For planoconcave lens

$u = -(40-30) = -10\,cm, \quad f = -10\,cm$ } 1.

$\frac{1}{v} - \frac{1}{-10} = -\frac{1}{10} \quad \therefore \quad v = -5\,cm$

virtual, inverted & size of final image = 1 cm } 1.

(ii) (a) $\frac{1}{f} = (\mu-1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right) = (1.6-1)\left(\frac{1}{24} - \frac{1}{-24}\right)$

$= (0.6) \times \frac{1}{12} = \frac{6}{12 \times 10} = \frac{1}{20}$ } $1\frac{1}{2}$ } $1\frac{1}{2} + \frac{1}{2}$

$f = +20\,cm$

(b) $f' = 2f = 40\,cm$ ———— } $\frac{1}{2}$

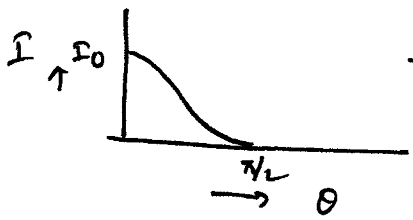
Q25 (i) Condn for constructive & destructive Interference } 3.

(ii) $\frac{n\lambda_1 D}{d} = (n+1)\frac{\lambda_2 D}{d} \Rightarrow n = 3$ } 2.

$\therefore \quad y = \frac{n\lambda_1 D}{d} = 12 \times 10^{-3}\,m.$

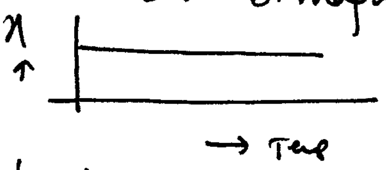
OR

(i) (a) ———— 1+1. } 1+1+1+2
(b) ———— 1.
(ii)



— 2

Q26 (i) (a) — A = Paramagnetic / Ferromagnetic } 1+1 = 2
B = Diamagnetic

(b) 

———— 1. } (1+1+1+ $1\frac{1}{2}$ + $\frac{1}{2}$)

(ii) $\left(\frac{1}{2} + \frac{1}{2} + \frac{1}{2}\right) = 1\frac{1}{2}$ + Greater — $\frac{1}{2}$

OR

(i) Diagm — $(1\frac{1}{2})$ + working — (2) } $(1\frac{1}{2} + 2)$

(ii) (1) Path — circular — $(\frac{1}{2})$ (2) $\nu = \frac{eB}{2\pi m} = 2.24 \times 10^7\,Hz$ — $(\frac{1}{2})$ } $1\frac{1}{2} + 2 + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}$

(3) No change in KE — $(\frac{1}{2})$