PS1012 GUIDE (1) 2024

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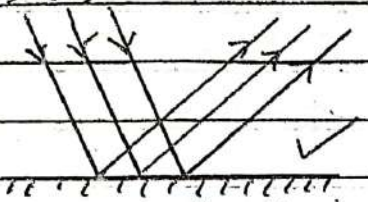
DRAFT

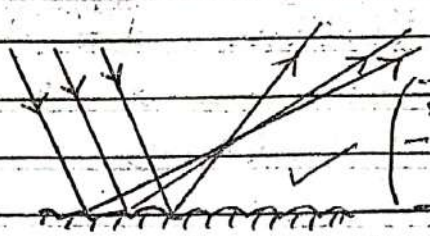
Subject: ..... Paper code: .....

Level: ☐ PLE ☐ UCE ☐ UACE Year: .....

1. (a) (i)



Regular reflection



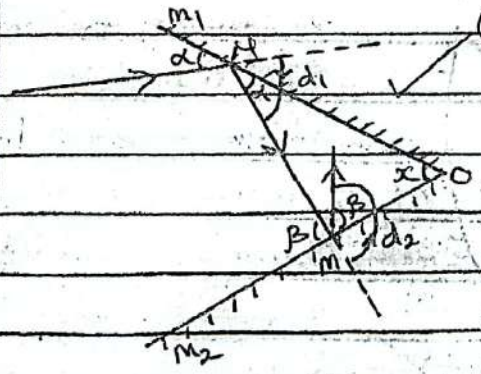
Irregular reflection

(- nature of surfaces
- form of reflection
- arrows) must, for 1 mark, penalise

In regular reflection, an incident parallel beam falls on a smooth surface and is reflected parallel, while in irregular reflection, an incident parallel beam falls on a rough surface and is reflected as a scattered beam. (04)

- smooth / polished surface	rough surface
- reflected as parallel beam	reflected as scattered beam in different directions

(ii) consider a light ray incident on a plane mirror M_1, inclined to another plane mirror M_2 as shown below:



(rays, angles, mirrors)

Let α and β be the glancing angles on M_1 and M_2 respectively.

The light ray undergoes deviations d_1 and d_2 as shown.

At M_1, $d_1 = 2\alpha$ clockwise

At M_2, $d_2 = 2\beta$ anticlockwise.

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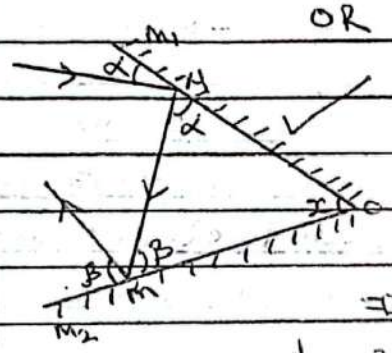
Net deviation, $d = d_1 + d_2 = 2(\beta - \alpha)$

From ΔOMM_1, $\alpha + x = \beta \Rightarrow x = \beta - \alpha$.

$\therefore d = 2(\beta - \alpha) = 2x$. (04)

OR



$d_1 = 2\alpha$ clockwise

$d_2 = 2\beta$ clockwise

$d = d_1 + d_2 = 2(\alpha + \beta)$

From ΔOMM_1, $\alpha + \beta = 180 - x$

$\Rightarrow 2(\alpha + \beta) = 360 - 2x$

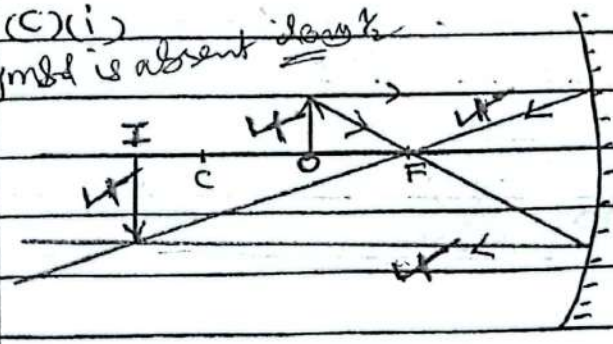
$d = 360 - 2x$

$d = 2x$ anticlockwise.

(b) marks redistributed additional 1 mark to 1.(a)(i) (04), (ii) (04), (c)(ii) 03, (d) 05.

(c)(i)

if mirror symbol is absent deduct ½



- Position of the object
- reflection
- Image beyond C real image
- mirror symbol

(02)

(ii)

$\frac{u}{f} = 1 + \frac{1}{m} \Rightarrow \frac{u}{24} = 1 + \frac{1}{3} \Rightarrow u = 32cm$ (03)

OR $\frac{1}{f} = \frac{1}{u} + \frac{1}{v} \Rightarrow \frac{1}{24} = \frac{1}{u} + \frac{1}{3u} \Rightarrow u = 32cm$

$\frac{R-d}{h}$ or $\frac{R-d}{h-d}$

(3)

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Using concave mirror of focus R, candidate loses 1 mk.

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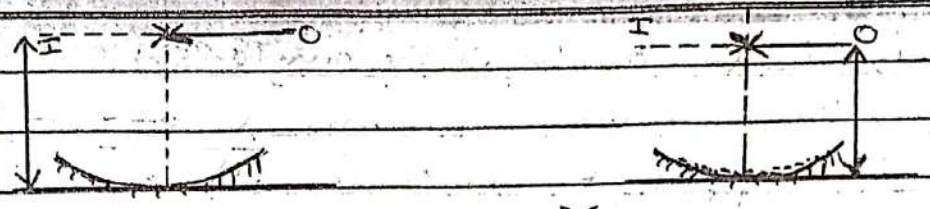
(d)



first 2½ ticks on diagram

A concave mirror is placed on a horizontal table with its reflecting surface facing upwards. An optical pin is clamped horizontally with its tip or end lying along the principal axis of the mirror. The optical pin is slowly raised or lowered until a position is obtained where it coincides with its image when there is no parallax. The distance from the mirror to the pin is measured as R. A small quantity of a liquid is poured into the mirror, and the optical pin is again adjusted until it coincides with its image. The distance between the pin and the mirror is measured as h. The refractive index of the liquid is obtained from

$n = \frac{R}{h}$ (05)

(e) When a wide parallel beam of light is incident on a converging mirror, the reflected rays converge at different points along the axis of the mirror. A curve which passes through the point of intersection of the reflected and incident rays, forming a cusp at the principal focus of the mirror is known as a caustic curve. (02)

[first 2 half ticks can be recovered on ray diagram]

* rays drawn & caustic curve indicated

(4)

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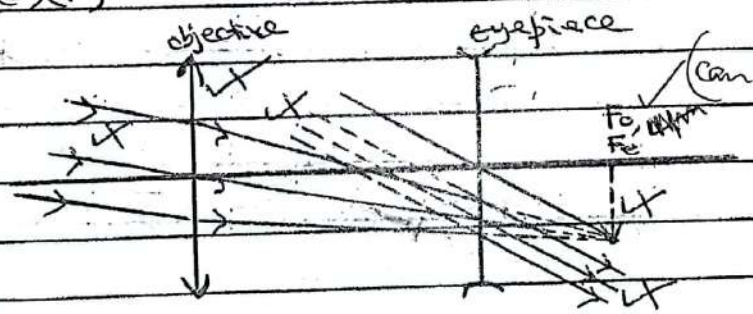
2. (a) (i) Visual angle is the angle subtended at the eye by the object / image. ~~at the eye~~

(ii) The apparent size of the object or image is proportional to the visual angle. An object near the eye subtends a larger angle at the eye than a distant one, Hence a nearer object appears taller. (03)

(1 mark can be scored on a diagram).

(b) (i)



(Can be recovered in description)
- distant object
- Relative position of lens
- apparent eye
- images

The objective lens is arranged with the eye piece such that their principal foci coincide. The objective forms a real image of a distant object on their common focal plane or (at its principal focus), and the eye piece forms a final virtual image at infinity. (05)

(ii) Advantages

- It forms an upright image
- It is short and therefore easily portable.

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Limitations

- It has a virtual eye-ring.
- It has a narrow field of view. (02)

(c)(i) - By inserting a convex lens between the eye piece and the objective such that the position of the lens is at a distance equal to the focal length from both the principal focus of the eye piece and the objective. (02)

(ii) - It increases the length of the telescope thus making it less portable.
- It decreases the brightness of the final image.
- Narrow field of view (01)

(d)(i) $m = \frac{f_o}{f_e} = \frac{200}{2} = 100$ (02)

(ii) $\frac{1}{f} = \frac{1}{u} + \frac{1}{v} \Rightarrow \frac{1}{2} = \frac{1}{202} + \frac{1}{v} \Rightarrow v = 2.02\ cm$ (02)

(iii) Linear magnification of eyepiece $= \frac{v}{u}$

$\frac{v}{u} = \frac{D_e}{D_o}$ where D_e = eyering diameter, D_o = objective diameter.

$\therefore \frac{2.02}{202} = \frac{D_e}{20}$

$\Rightarrow D_e = 0.2\ cm$ (02)

OR

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3a (i) Amplitude is the maximum displacement of a wave particle or particles in the wave from the equilibrium position ✓ D

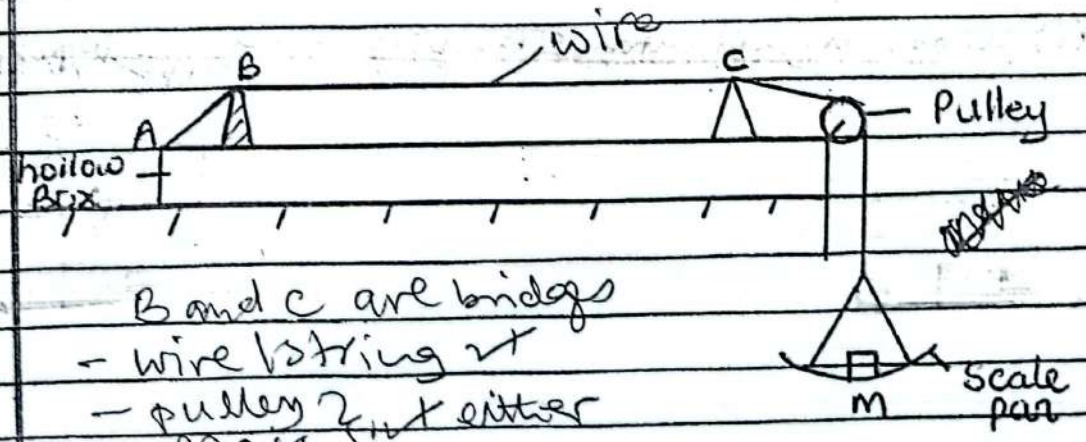
(ii) Transverse waves are waves which propagate by vibrations perpendicular to the direction of travel of the wave whereas longitudinal waves are waves which propagate by vibrations which occur parallel to the direction of travel of the wave ✓

OR ~~Transverse waves can be polarised whereas longitudinal waves are not~~ ~~Polarised~~

OR Transverse waves propagate by formation of crests and troughs whereas longitudinal waves propagate by formation of rarefactions and compressions.

NB Accept "motion or move" for vibration.

b



B and C are bridges
- wire/string ✓
- pulley ✓
- mass ✓ either

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The experiment is set up as shown above. The length L of the wire between the bridges B and C is fixed. A suitable load m is attached to the free end of the wire. The wire is plucked in the middle and a tuning fork of known frequency (f) is sounded & held near the wire. The mass is varied until the vibration of the wire resonates with that of the tuning fork. The mass m and the corresponding frequency f are recorded in a table including values of f^2. The procedure is repeated with tuning forks of different frequencies f.

A graph of f^2 against m is plotted and it is a straight line through the origin. This implies that $f^2 \propto m$ but the tension $T = mg$

$\Rightarrow m = T/g \Rightarrow f^2 \propto T$ since g is a constant and $f \propto \sqrt{T}$

NB Accept :- "when loud sound is heard" or "then resonance occurs"

- If plucking is not in middle, deny ½ mk

Accept rider as detector but in this case the fork should be placed in middle of the length of box

tuning fork placed near mouth of tube placed on
↑ detector

(8)

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3c (i) $L_1 + c = \lambda/4$ ——— (1)

$L_2 + c = 3/4\,\lambda$ ——— (2)

$L_2 - L_1 = \lambda/2$

$\Rightarrow \lambda = 2(L_2 - L_1)$

But $V = f\lambda$

$\therefore V = 2f(L_2 - L_1)$

$= 2 \times 264 \times (0.963 - 0.315)$

$= 342$ m/s

OR $V = 2f(L_2 - L_1)$

$= 2 \times 264 \times (0.963 - 0.315)$

$= 342$ m/s

OR $V = 2f(L_2 - L_1)$

$= 2 \times 264 \times (0.963 - 0.315)$

$= 34200\ cms^{-1}$

(ii) $L_1 + c = V/4f$

$31.5 + c = \frac{34200}{4 \times 264}$

$31.5 + c = 32.4$

$\Rightarrow c = 0.9$ cm

3d (i) Beats are the periodic rise and fall in intensity of sound when two notes of nearly equal frequencies are sounded together

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(9)

(ii) The test note is sounded together with a standard note of frequency f_1. The number n of loud sounds heard in a measured time t is recorded. The beat frequency $f_b = n/t$ is calculated. The frequency of the standard note is reduced slightly and the experiment is repeated.

The new beat frequency f_b' is determined

If $f_b' > f_b$ then the frequency f_2 is $f_2 = f_1 + f_b$

if $f_b' < f_b$ then the frequency $f_2 = f_1 - f_b$

0!

(10)

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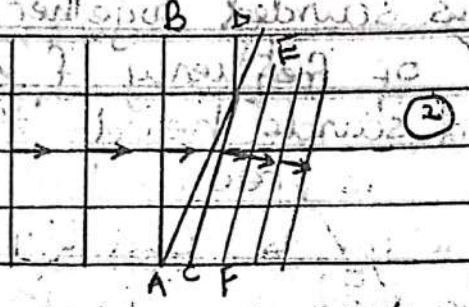
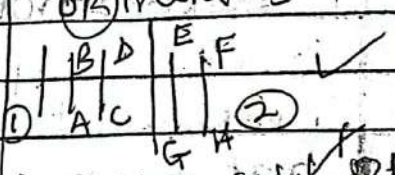
4a



OR method 3



~~As wave moves from ① to ② λ reduces. But BD = AC and EF = GH ⇒ EG is parallel to DC Hence direction does NOT change~~

$BD = V_1 t$

$AC = V_2 t$

$\therefore V_2 < V_1$ and $AC < BD$

The direction of travel of the wave changes and hence refraction.

OR

As the wave moves from medium ① into ②, the wavelength reduces

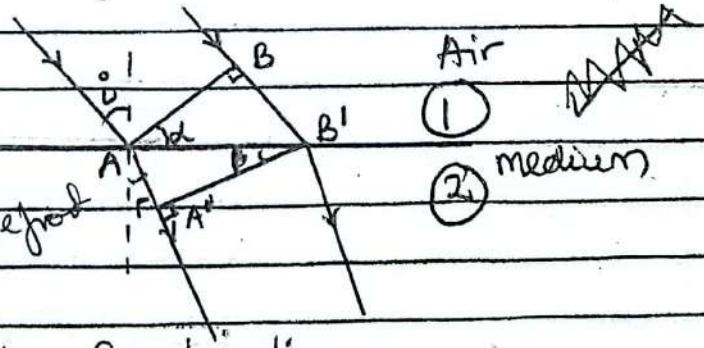
$\Rightarrow BD > CF$

Hence the new wavefront gets inclined

Hence direction of the wave changes which is refraction.

4b

- Angles
- medium
- Incident beam
- reflected beam
- incident wavefront
- Reflected wavefront



Huygen's Construction

Consider a plane wavefront AB. Every point on AB acts as a secondary source of wavelets

(11)

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In time t, secondary wavelets from A travel a distance AA'. AA' = Vt

During this time secondary wavelets from B travel to B'. BB' = ct

The tangent A'B' to the secondary wavelets is the new wavefront 05

From snell's law, the refractive index n is

$n = \frac{\sin i}{\sin r}$ but $i = \alpha$ and $r = \beta$ (can be seen on diagram)

$\Rightarrow n = \frac{\sin\alpha}{\sin\beta}$ But $\sin\alpha = \frac{BB'}{AB'}$ and $\sin\beta = \frac{AA'}{AB'}$

$\therefore n = \frac{BB'}{AB'} \div \frac{AA'}{AB'} = \frac{BB'}{AA'} = \frac{ct}{Vt} = \frac{c}{V}$

4C (i) When two waves of equal frequency and equal wavelength (coherent sources) travel in the same medium, they superpose. Where they meet in phase, reinforcement takes place resulting in maximum intensity. Where they meet completely out of phase, cancellation takes place resulting in minimum intensity / soft sound. Permanent alternate regions of maximum and minimum intensity is therefore observed which is referred to as interference patterns 03

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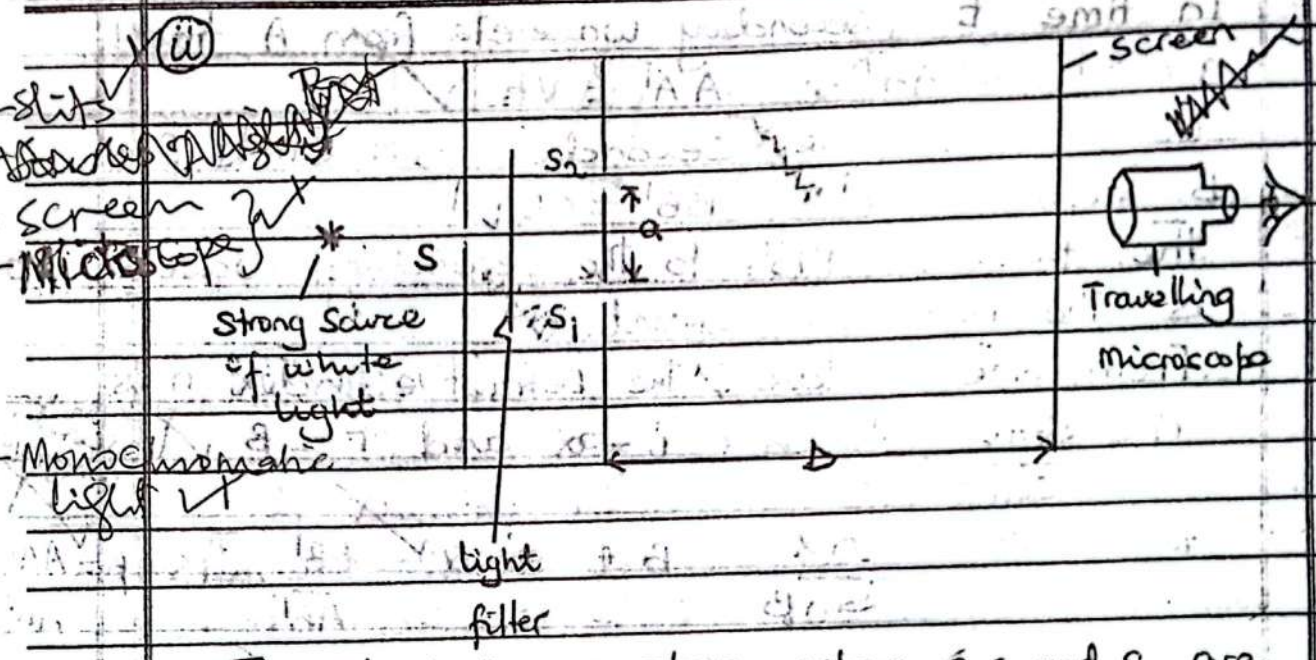
(ii)

- slits
- screen
- Microscope
- Monochromatic light



The set up is as above, where S, S_1 and S_2 are narrow slits through which light diffracts forming interference fringes on the transparent screen. The position of the screen is adjusted until where the fringes are seen clearly. The number of fringes occupying a measured length along the screen is counted and the width y of a single fringe determined. The distance D of the double slits from the screen is measured using a metre rule and the separation a of the double slits determined using a travelling microscope. The wavelength λ, is now calculated from $\lambda = \frac{ay}{D}$

4d $d = \frac{10^3}{500}$ $d\sin\theta = n\lambda$ where $\sin\theta = \frac{n\lambda}{d} = 1$

diffraction grating

$\therefore n = d/\lambda = 10^{-3}/589 \times 10^{-3} = 3.39$

$\therefore$ maximum order of diffraction $= 3$

max no of images is 7

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QUESTION 5

(a) - Heating in the coil causes loss of energy due to electrical resistance of the wire. 03

- Heating in the core causes loss of energy due to eddy currents. (any 3

- Heating in the core due to loss of energy due to magnetic reversals

- Energy loss due to magnetic flux leakage.

(b)(i) Current in the transmission wire, $I = \frac{P}{V}$

$\Rightarrow I = \frac{200}{230} = 0.8696\,A$ 03

Power loss, $P = I^2R$

$= 0.8696^2 \times 3$

$= 2.27\,W$

(ii) At the power station the voltage is stepped up and current reduces.

Power loss, $P = I^2R$ or $P \propto I^2$ which is minimized. 03

At the machine, the voltage is stepped down to the required values to operate the machine.

(c) Magnetic flux linking N turns of the coil, $\phi = BAN\cos\theta$. But $\theta = 0$, 04

$\Rightarrow \phi = BAN$

The induced emf $E = -\frac{d\phi}{dt} = \frac{d}{dt}(BAN)$.

Since BAN is constant, $E = 0$

OR $\phi = NBA\cos\omega t$

$E = -\frac{d\phi}{dt}$

$= -NBA\frac{d}{dt}\cos\omega t$

$= \omega NBA\sin\omega t$

But $\Rightarrow E = 0$

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(d)(i) Two circuits have a mutual inductance of 1 henry if the induced emf in the secondary coil is 1V when the current in the primary coil changes at a rate of 1 ampere per second.

(ii) $E = -M\frac{dI}{dt} = -30 \times \frac{(0-1.5)}{0.002} = 22500V$

(e)(i) When the armature of the motor rotates in the magnetic field, emf is induced in the coil. This emf opposes the supply (applied) voltage. This emf is called back emf.

(ii) - It reduces current which would have damaged the coil.
- Work done against back emf is converted into mechanical work.
- It increases efficiency of the motor.

(14)

(15)

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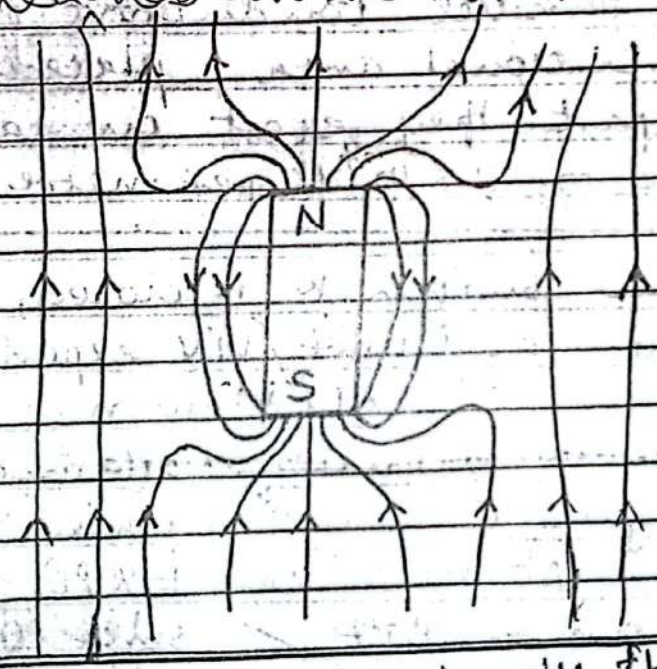
QUESTION 6

(a) (i) Magnetic field is a region in space where magnetic force is experienced. 01

(ii) Magnetic Saturation is said to occur when a given magnetic material has attained its maximum magnetic strength such that further magnetisation does not increase its strength. 01

~~When has attained its maximum strength~~

(b)(i)



direction
pattern
orientation 01

(ii) The inductor is placed with the plane of its coil horizontal. The coil is turned through 180° about the vertical diameter. The first deflection θ_N is noted. The coil is now placed with the plane of the coil vertical such that its plane is perpendicular to the N-S direction. (04)

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The coil is now rotated through 180°. The first deflection θ_h is noted. The angle of dip, δ is now calculated from $\delta = \tan^{-1}\left(\frac{\theta_v}{\theta_h}\right)$

(c)(i) The ampere is the value of current which if maintained in two infinitely long, parallel conductors of negligible cross-sectional area, placed in vacuum 1m apart they exert on each other a force of 2×10^{-7} N per metre length.

(ii) When switch K is closed, current flows and wire WV experiences a force, $F' = BIl$ downwards. ~~Horizontal balance is attained when~~ weight $F = mg$ is placed in the scale pan. At balance $F \times PQ = F' \times YW$

$\Rightarrow mg = BIl$ since $\overline{PQ} = \overline{YW}$

$= (\mu_0 I n) I l$ ie $B = \mu_0 n I$

$\Rightarrow I = \sqrt{\frac{mg}{\mu_0 n l}}$

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(17)

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(d) (i) $B = \frac{\mu_0 I}{2\pi a}$ ✓

$B_Q = B_P - B_R$ ✓ $= \frac{4\pi \times 10^{-7}}{2\pi}\left(\frac{9}{0.03} - \frac{5}{0.05}\right)$ ✓✓ 04

$= 6\times10^{-5} - 2\times10^{-5}$

$\Rightarrow B_Q = 4.0\times10^{-5}\,T$ ✓

for $B_Q = B_P + B_R$ losses 2mks

Accept $B_Q = B_R - B_P$

(ii) $F = \frac{\mu_0 I_P I_R}{2\pi a}$ ✓ $= \frac{4\pi\times10^{-7}\times9\times5}{2\pi\times0.08}$ ✓ 03

$= 11.25\times10^{-5}\,Nm^{-1}$ ✓

(e) B - Magnetic flux density ✓

A - Area of the coil ✓

N - Number of turns ✓

K - Strength of the hairspring ✓ (02)

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7a(i) Root Mean Square value of an a.c is the value of steady current which dissipates heat in a given resistor at the same rate as the a.c (1)

(ii) Reactance is the non-resistive opposition to the flow of an alternating current in an inductor or a capacitor or both. (1)

(iii) Impedence is the total opposition to the flow of an alternating current in an a.c circuit containing resistive and reactive components. (1)

(b) Consider a capacitor connected to an a.c source of $V = V_0 \sin\omega t$ and $I = I_0 \cos\omega t$

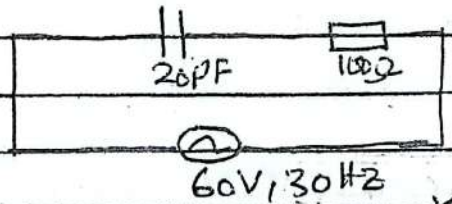
$P = IV = I_0 \cos\omega t \times V_0 \sin\omega t = I_0 V_0 \sin\omega t \cos\omega t$ (3)

$= \frac{1}{2} I_0 V_0 \sin 2\omega t$

$\langle P \rangle = \frac{I_0 V_0}{2} \langle \sin 2\omega t \rangle$, but $\langle \sin 2\omega t \rangle = 0$

$\langle P \rangle = 0$

(c)



For a capacitor $X_C = \frac{1}{C\omega} = \frac{1}{20\times10^{-6}\times2\times3.14\times30} = 265.452$

$Z = \sqrt{X_C^2 + R^2} = \sqrt{265.4^2 + 100^2} = 283.6$ (5)

$V = IZ \Rightarrow I_0 = \frac{V_0}{Z} = \frac{60}{283.6} = 0.212A$

$I_{rms} = \frac{I_0}{\sqrt{2}} = \frac{0.212}{\sqrt{2}} = 0.15A$

(8)

(19)

$V = V_0, I = 0$

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{ fully charged opposition max } ✓

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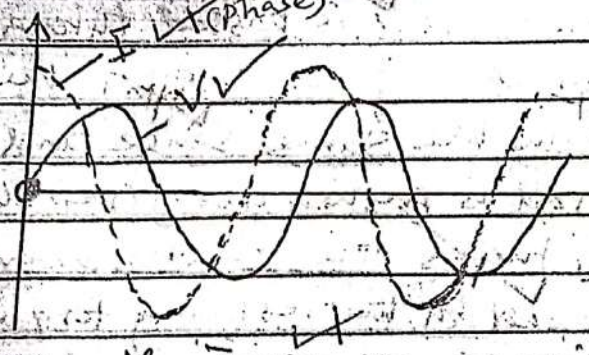
d(i)

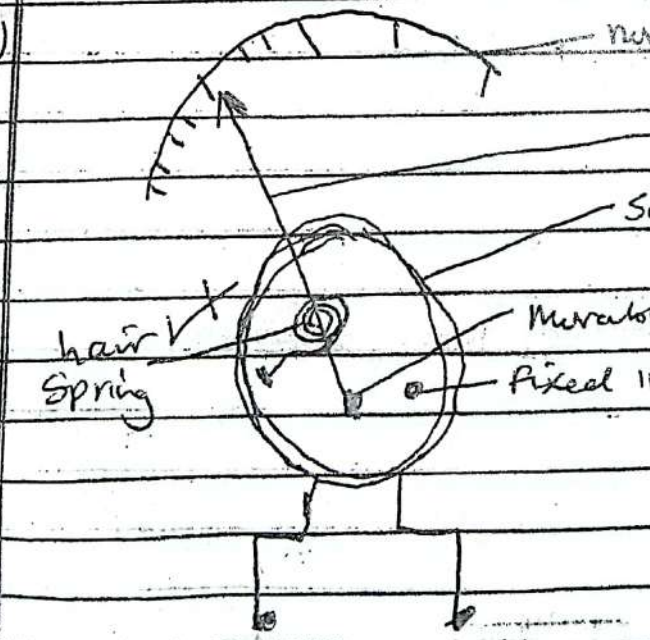


(2)

(ii) When $V = V_0$, $I = 0$ the capacitor is fully charged repulsion to any charge coming to the capacitor plates is maximum. (2)

When $V = 0$, I is maximum the capacitor is completely empty (discharged), opposition to the flow of charge to the plates is zero so current is maximum.

(e)



(2)

(20)

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Current to be measured is passed through the coil. Whatever the direction of the current the rods get magnetised in the same sense and repel. The movable rod is pushed away (repelled) and as it moves, it turns the pointer over the scale until it is stopped by the restoring torque of the spring. The deflection of the pointer is perportional to the magnetic force. Hence the deflection is perportional to the square of the average current. (3)

$F = BIl$, but $B = \mu_0 nI$

$\therefore B \propto I$

$F = \mu_0 n I^2 l$

$\therefore F \propto I^2$

Accept magnetisation is proportional to current instead of force

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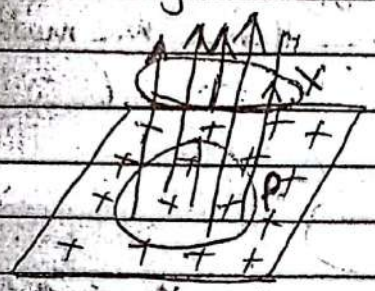
SECTION D

8a(i) Electric field: Is a region in space where electric force is experienced. (1)

Electric flux: Is the product of electric field intensity and the area it links normally. (1)

(b)



Consider a plane conductor P of surface charge density σ and plane X of area S.

$\phi = \frac{\text{charge enclosed by X}}{\text{permittivity of the medium}}$

$= \frac{\sigma \times S}{\varepsilon_0}$ but $Q = \sigma \times S$ (3)

$\phi = E \times S$

$\therefore E \times S = \frac{\sigma \times S}{\varepsilon_0}$

$E = \frac{\sigma}{\varepsilon_0}$

c(i) Electric force on the drop $= qE = q\frac{V}{d}$

for equilibrium $q\frac{V}{d} = mg$ (upthrust negligible since drop is small.)

$q = \frac{mgd}{V} = \frac{5.9\times10^{-4} \times 9.81 \times 2\times10^{-2}}{20\times10^{3}} = 5.7879\times10^{-19}\,C$ (04)

Now $q = ne \Rightarrow n = q/e = \frac{5.7879\times10^{-19}}{1.6\times10^{-19}} = 3.6$

n = 3 electrons or 4 electrons.

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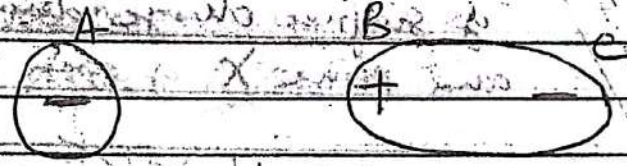
(iii) The material is enclosed in a metal can and placed in the electric field. ✓
Charge (electric field) inside the can is zero. ✓
The electric field due to the metal plate is only affects distribution of charge on the outer surfaces of the metal can. Hence the material is shielded. ✓ (3)

(d)



Consider a negatively charged material A. When a neutral conductor BC is brought near it as shown above, positive charge is induced on its near side B and negative charge on side C. ✓ (Can be awarded on diagram)
The potential ~~due to~~ at A is the sum of potentials due to its charge and the nearby charges. ✓ (4)
Since the positive charge is closer to A, the resultant potential due to the induced charge is positive. This reduces the negative potential of A. ✓

reduces potential ✓
increases potential ✓
reduces negative negative potential ✓

Conductor

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(e) When a pin is placed on a charged conductor, Charge (high charge density) concentrates at the sharp point of the pin. A high electric field intensity develops around the sharp point which ionises air. These ions of opposite charge are attracted and neutralised. This the conductor loses charge faster (4)

OR

When a pin is placed on a charged conductor, charge concentrates at the sharp point of the pin. A high electric field intensity develops around the sharp point. The electric field intensity exerts strong attraction to the opposite (space charge) charge in the space, which are then neutralised. This way the conductor loses charge faster (4)

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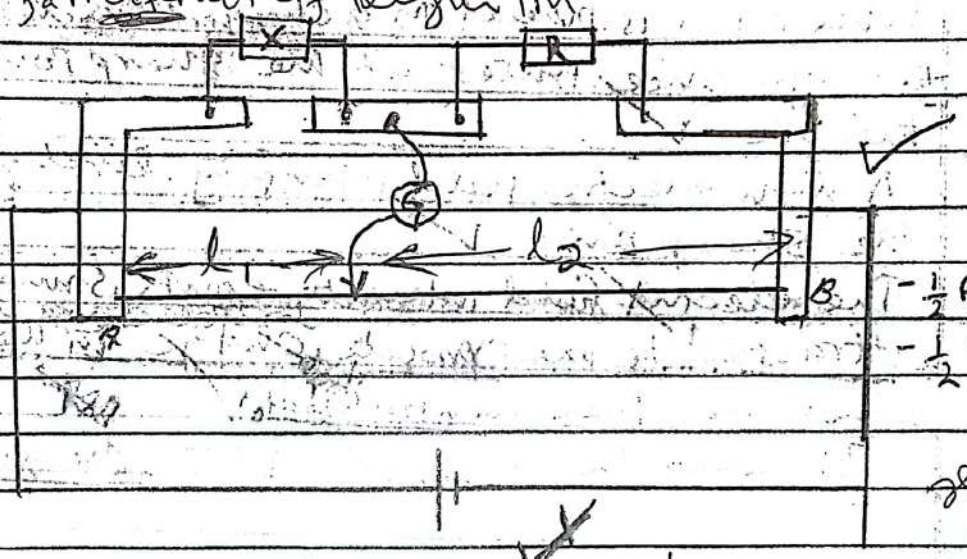
9(a) (i) Temperature coefficient of resistance is fractional change in resistance at 0°C per degree Celsius rise in temperature.

(ii) Resistivity is the resistance of a material of length 1m and cross sectional area of $1m^2$ ✓ 02

Resistance across opposite faces of a cube of a material of length 1m.

(b) (i)



- ½ for cells
- ½ for wire effect
- Unit
- R-stan

Unknown resistance X is connected in left hand gap of the bridge and standard resistance R is connected in right hand gap of the bridge.

For a known value of R, the jockey is tapped along the wire AB until the galvanometer shows no deflection.

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- The balance length L_1 and L_2 are measured.
- The experiment is repeated for several values of R and results are tabulated including $\frac{L_2}{L_1}$
- A graph of R against $\frac{L_2}{L_1}$ is plotted and its slope S is determined.
- The resistance R_x of X is given by $R_x = S$.

If no graph misses $\frac{1}{2}$ mark and $R_x = \frac{L_1}{L_2} R$ is 1 mar

05

(ii) when the balance point is near the middle point of slide wire, the errors in balance lengths on either sides are small compared to balance length. The error in the ratio of the balance lengths is small. Hence the error in resistance to be determined is small/accuracy is higher

c $R = \frac{\rho l}{A}$

$= \frac{4.4 \times 10^{-7} \times 200 \times 10^{-2}}{0.001 \times 10^{-4}}$

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$R = 8.8\,\Omega$ ✓ OR $R = \rho l/A$ ✓

$R_1 = \frac{4.4 \times 10^{-7} \times 1.00 \times 10^{-2}}{0.001 \times 10^{-4}} = 4.4$ ✓✓

$R_1 = R_2 = \frac{R}{2}$

$= \frac{8.8}{2}$ ✓

$= 4.4\,\Omega$

$R_2 = 4.4\,\Omega$ ✓

$R_e = \frac{4.4 \times 4.4}{4.4 + 4.4} = 2.2\,\Omega$ ✓✓

Total resistance $R_T = \frac{4.4 \times 4.4}{4.4 + 4.4} + \frac{1 \times 1}{1 + 1}$ ✓✓

$= 2.7\,\Omega$ ✓

$r_t = \frac{1 \times 1}{1 + 1} = 0.5\,\Omega$ ✓

$R_t = 2.2 + 0.5 = 2.7\,\Omega$ ✓

$I = \frac{e.m.f}{R_T}$ ✓

$= \frac{1.5}{2.7}$ ✓

$= 0.556\,A$ ✓

06

d. $P = I^2 R$ ✓

But $I = \frac{E}{R + r}$ ✓

$P = \left(\frac{E}{R + r}\right)^2 R$ ✓

$P = \frac{E^2 R}{(R + r)^2}$

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$$\frac{dP}{dR} = \frac{E^2\left[(R+r)^2 - 2R(R+r)\right]}{(R+r)^4}$$

$$= E^2\frac{(r-R)}{(R+r)^3}$$

For max power

$\frac{dP}{dR} = 0$ thus $r - R = 0$

$R = r$

04

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10 a) ii) Dielectric constant is the ratio of capacitance of a capacitor with a dielectric material between it's plates to capacitance of the same capacitor with out dielectric

or

is ratio of permittivity of dielectric to permittivity of free space

(ii) Dielectric strength is the maximum p.d per ~~unit~~ metre thickness which a dielectric can with stand without conducting/insulation breaks down breaks

Potential gradient, Electric field intensity.

(b) - when a dielectric is plated between the plates of a charged capacitor it's molecules get polarised.

- The charges inside the dielectric cancel each others and surfaces of dielectric acquire charge opposite to charge of the plate near the surface.

- since those are bound charges then can not be neutralized

Charge on plate induced by the charge
Potential of negative plate reduces potential of +ve plate
Negative charge reduces
pd reduces
C = Q/V
C reduces

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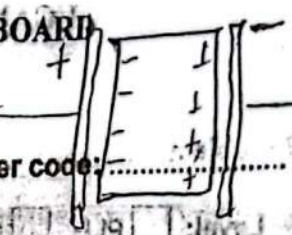

Charge induced
Adjacent surface charge

- an electric field intensity is developed between the surfaces of a dielectric in direction opposite to that of applied field
- The resultant electric field intensity reduces from $E = \frac{V}{d}$
pd V reduces
Also from $C = \frac{Q}{V}$, capacitance of capacitor increases

Note: If battery in place, take about more charge flows to capacitors from $Q = CV$, charge increases

C charge stored, $Q = CV$

$= 50 \times 45 \times 10^{-6}$

$= 2.25 \times 10^{-3}$ C

$C_0 V_0 = (C_1 + C_2) V$

after inserting $= 2 \times 50 = 100\ \mu F$

$C_T = C' + C''$

$= 100 + 60$

$= 160\ \mu F$

$V = \frac{C_0 V_0}{C_1 + C_2}$

$= \frac{50 \times 45 \times 10^{-6}}{[(50 \times 2) + 60] \times 10^{-6}}$

$= 14.1$ V

$V = \frac{Q}{C_T} = \frac{2.25 \times 10^{-3}}{160 \times 10^{-6}} = 14.1$ V

04

(iii) $E_1 = \frac{1}{2} C V^2$

$= \frac{1}{2} \times 50 \times 10^{-6} \times 45^2$

$= 5.06 \times 10^{-2}$ J

After comb.

$E_2 = \frac{1}{2} \times 160 \times 10^{-6} \times 14.1^2$

$= 1.59 \times 10^{-2}$ J

$\Delta E = E_1 - E_2$

$= (5.06 - 1.59) \times 10^{-2}$

$= 3.47 \times 10^{-2}$ J

3.47×10^{-2} J

04

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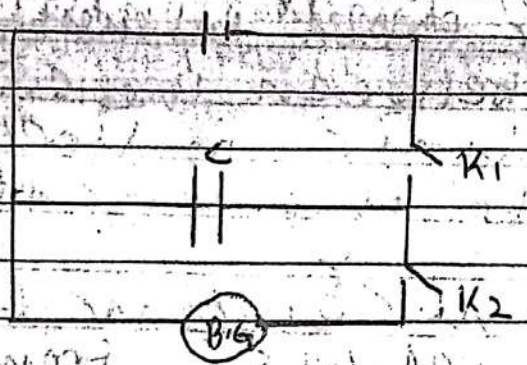
d (i)



without the given circuit

A capacitor of capacitance C_1 is connected at C. switch K_1 is closed and after some time K_1 is opened. K_2 is closed and max deflection θ_1 of B.G is noted. The capacitor of C_1 is replaced with another capacitor of capacitance C_2 and above procedures are repeated.

The new deflection θ_2 of B.G is noted.

capacitances are compared from $\frac{C_1}{C_2} = \frac{\theta_1}{\theta_2}$ 04

(ii) - It seperates the capacitor plates
- Increases capacitance of capacitor
- increases dielectric strength 01

END