

**Marking Scheme**  
**Strictly Confidential**  
**(For Internal and Restricted use only)**  
**Senior Secondary Supplementary School Examination, 2026 (XII<sup>th</sup>)**  
**SUBJECT NAME PHYSICS (042) (Q.P. CODE /Set No55/7/3)**

**General Instructions: -**

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully.                                                                                                                                                                                                                                                                           |
| 2  | <b>“Evaluation policy is a confidential policy as it is related to the confidentiality of the examinations conducted, evaluation done and several other aspects. Its leakage to public in any manner could lead to derailment of the examination system and affect the life and future of millions of candidates. Sharing this policy/document to anyone, publishing in any magazine and printing in Newspaper/Website, etc. may invite action under various rules of the Board and IPC.”</b>                                                                                                                                                                                                |
| 3  | Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one's own interpretation or any other consideration. Marking Scheme should be strictly adhered to and religiously followed. <b>However, while evaluating, answers which are based on latest information or knowledge and/or are innovative, they may be assessed for their correctness otherwise and due marks be awarded to them. In Class-XII, while evaluating two competency-based questions, please try to understand given answer and even if reply is not from marking scheme but correct competency is enumerated by the candidate, due marks should be awarded.</b> |
| 4  | The Marking scheme carries only suggested value points for the answers. These are in the nature of Guidelines only and do not constitute the complete answer. The students can have their own expression and if the expression is correct, the due marks should be awarded accordingly.                                                                                                                                                                                                                                                                                                                                                                                                      |
| 5  | The Head-Examiner must go through the first five answer books evaluated by each evaluator on the first day, to ensure that evaluation has been carried out as per the instructions given in the Marking Scheme. If there is any variation, the same should be zero after deliberation and discussion. The remaining answer books meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.                                                                                                                                                                                                                     |
| 6  | Evaluators will mark ( ✓ ) wherever answer is correct. For wrong answer CROSS 'X' be marked. Evaluators will not put right (✓) while evaluating which gives an impression that answer is correct and no marks are awarded. <b>This is most common mistake which evaluators are committing.</b>                                                                                                                                                                                                                                                                                                                                                                                               |
| 7  | If a question has parts, please award marks on the right-hand side for each part. Marks awarded for different parts of the question should then be totaled up and written in the left-hand margin and encircled. This may be followed strictly.                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 8  | If a question does not have any parts, marks must be awarded in the left-hand margin and encircled. This may also be followed strictly.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 9  | If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out with a note <b>“Extra Question”</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 10 | No marks to be deducted for the cumulative effect of an error. It should be penalized only once.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

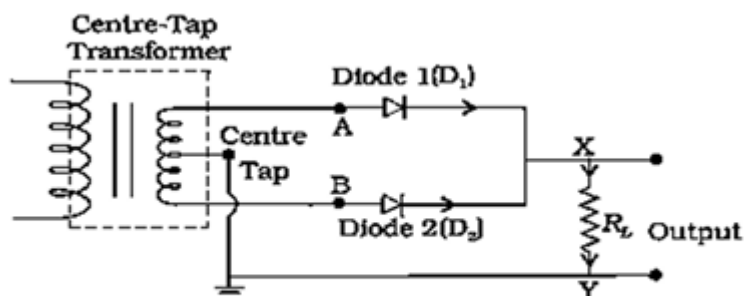
|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11 | A full scale of marks 70 (example 0 to 80/70/60/50/40/30 marks as given in Question Paper) has to be used. Please do not hesitate to award full marks if the answer deserves it.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 12 | Every examiner has to necessarily do evaluation work for full working hours i.e., 8 hours every day and evaluate 20 answer books per day in main subjects and 25 answer books per day in other subjects (Details are given in Spot Guidelines). This is in view of the reduced syllabus and number of questions in question paper.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 13 | <p>Ensure that you do not make the following common types of errors committed by the Examiner in the past :-</p> <ul style="list-style-type: none"> <li>• Leaving answer or part thereof unassessed in an answer book.</li> <li>• Giving more marks for an answer than assigned to it.</li> <li>• Wrong totaling of marks awarded on an answer.</li> <li>• Wrong transfer of marks from the inside pages of the answer book to the title page.</li> <li>• Wrong question wise totaling on the title page.</li> <li>• Wrong totaling of marks of the two columns on the title page.</li> <li>• Wrong grand total.</li> <li>• Marks in words and figures not tallying/not same.</li> <li>• Wrong transfer of marks from the answer book to online award list.</li> <li>• Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answer.)</li> </ul> <p>Half or a part of answer marked correct and the rest as wrong, but no marks awarded.</p> |
| 14 | While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as cross (X) and awarded zero (0) Marks.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 15 | Any unassessed portion, non-carrying over of marks to the title page, or totaling error detected by the candidate shall damage the prestige of all the personnel engaged in the evaluation work as also of the Board. Hence, in order to uphold the prestige of all concerned, it is again reiterated that the instructions be followed meticulously and judiciously.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 16 | The Examiners should acquaint themselves with the guidelines given in the <b>“Guidelines for Spot Evaluation”</b> before starting the actual evaluation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 17 | Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totaled and written in figures and words.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 18 | The candidates are entitled to obtain photocopy of the Answer Book on request on payment of the prescribed processing fee. All Examiners/Additional Head Examiners/Head Examiners are once again reminded that they must ensure that evaluation is carried out strictly as per value points for each answer as given in the Marking Scheme.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

## Code: 55/ 7 /3

Page 3 of 15

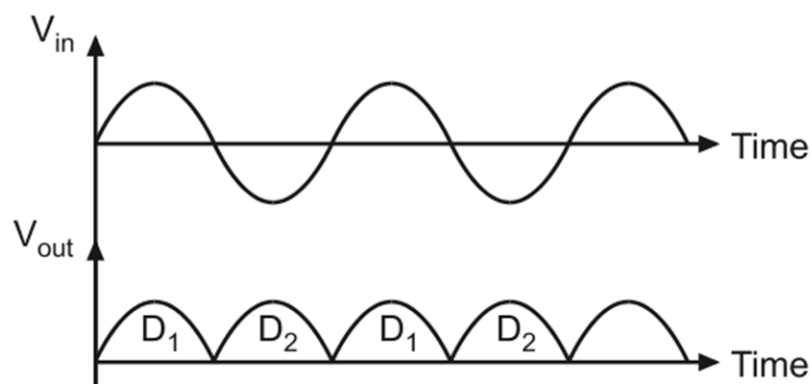
|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                     |   |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| 18. | <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>Finding the magnitude of the net magnetic field at the common centre of the coils (2)</p> </div> $\vec{B}_1 = \frac{\mu_0 I}{2r} \hat{k}$ $= \frac{4\pi \times 10^{-7} \times 1}{2 \times 0.1} \hat{k}$ $\vec{B}_1 = 2\pi \times 10^{-6} \hat{k} \text{ T}$ $\vec{B}_2 = \frac{4\pi \times 10^{-7} \times \sqrt{3}}{2 \times 0.1} \hat{i}$ $\vec{B}_2 = 2\sqrt{3} \pi \times 10^{-6} \hat{i} \text{ T}$ $B_{\text{net}} = \sqrt{B_1^2 + B_2^2}$ $= 4\pi \times 10^{-6} \text{ T}$ $= 1.26 \times 10^{-5} \text{ T}$                                                                                                                                                                                                                      | <div style="text-align: center;">½</div> <div style="text-align: center;">½</div> <div style="text-align: center;">½</div> <div style="text-align: center;">½</div> | 2 |
| 19. | <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>(i) Finding the energy of photon emitted for transition of electron from second energy level to first energy level (1)</p> <p>(ii) Finding the energy of photon emitted for transition of electron from highest energy level to first energy level (½)</p> <p>(iii) Finding the ratio of the above two energies. (½)</p> </div> <p>(i) Use <math>E_n = -\frac{13.6}{n^2}</math></p> $\Delta E_{21} = E_2 - E_1$ $= -13.6 \left( \frac{1}{4} - 1 \right)$ $\Delta E_{21} = 13.6 \times \frac{3}{4} \text{ eV} \quad \dots(1)$ $\Delta E_{\infty 1} = -13.6 \left( \frac{1}{\infty} - 1 \right)$ $\Delta E_{\infty 1} = 13.6 \text{ eV} \quad \dots(2)$ <p>From (1) and (2),</p> $\frac{\Delta E_{21}}{\Delta E_{\infty 1}} = \frac{3}{4}$ | <div style="text-align: center;">½</div> <div style="text-align: center;">½</div> <div style="text-align: center;">½</div> <div style="text-align: center;">½</div> | 2 |
| 20. | <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>(a) Explaining with reason</p> <p>(i) The frequency of the reflected and refracted light is same as that of the incident light. (1)</p> <p>(ii) Reduction in the energy carried by the light wave due to decrease in speed in denser medium. (1)</p> </div> <p>(i) Yes</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ½                                                                                                                                                                   |   |

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                 |   |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|---|
|                    | <p>The atoms of the interface can be regarded as oscillators. The light incident on the interface forces the atomic oscillators to oscillate with the frequency of the incident light.<br/>Thus, the frequency of the reflected and refracted light equals the frequency of incident light.</p> <p>(ii) No<br/>Energy carried by the light wave depends on the amplitude of the wave, not on the speed of wave propagation.</p> <p style="text-align: center;">OR</p> <div style="border: 1px solid black; padding: 5px;"> <p>(b) (i) Effect on the image of an object placed in front of the mirror (1)<br/>(ii) Writing refractive index of the liquid (½)<br/>Giving reason (½)</p> </div> <p>(i) The image will be formed that of the whole object. However, the intensity of the image will be low (or half)</p> <p>(ii) The refractive index of the liquid = 1.5</p> <p>Since lens disappears inside the liquid which is possible only when both have same refractive indices.</p> | <p>½</p> <p>½<br/>½</p> <p>1</p> <p>½<br/>½</p> | 2 |
| 21.                | <div style="border: 1px solid black; padding: 5px; text-align: right;">Calculating the average number of collisions (2)</div> $\rho = \frac{m}{ne^2\tau}$ <p>Therefore,</p> $\tau = \frac{m}{ne^2\rho}$ <p>where, <math>\tau</math> = Average time/collision</p> <p>Average number of collisions per second = <math>\frac{1}{\tau}</math></p> $\frac{1}{\tau} = \frac{ne^2\rho}{m}$ <p>Average number of collisions, <math>\frac{1}{\tau} = \frac{8.5 \times 10^{28} \times (1.6 \times 10^{-19})^2 \times 1.72 \times 10^{-8}}{9.1 \times 10^{-31}}</math><br/> <math>= 4.11 \times 10^{13}</math> per second</p>                                                                                                                                                                                                                                                                                                                                                                       | <p>½</p> <p>½</p> <p>½<br/>½</p>                | 2 |
| <b>SECTION – C</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                 |   |
| 22.                | <div style="border: 1px solid black; padding: 5px;"> <ul style="list-style-type: none"> <li>• Drawing a labelled diagram of a full-wave rectifier (1)</li> <li>• Stating its working principle (1)</li> <li>• Showing input and output waveforms (1)</li> </ul> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                 |   |



Working principle : A p-n junction diode allows current to pass only when it is forward biased.

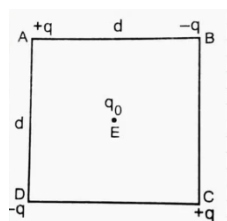
**Alternatively:** A p-n junction diode offers low resistance when forward biased.



23.

Calculating the amount of

- (i) work done to obtain the required arrangement (2)
- (ii) extra work done in bringing  $q_0$  to the centre of the square (1)



(i) Total work needed to bring charges on their respective points is sum of work done to bring individual charges and place them on respective points of square

Total work done =  $W_A + W_B + W_C + W_D$

Since  $W = q \times \text{potential at that point}$

Total work done =  $qV_A + (-q)V_B + qV_C + (-q)V_D$



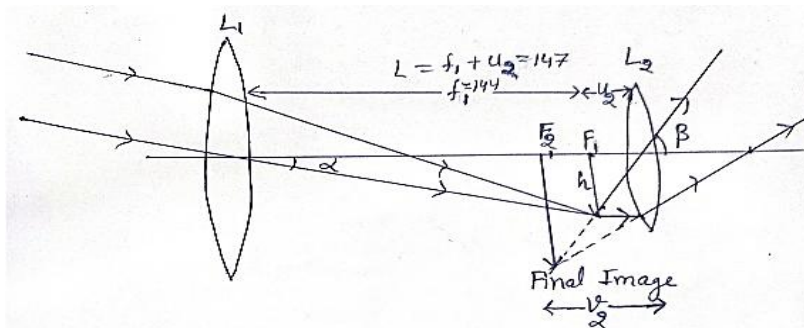
|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                  |   |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|---|
|     | $\vec{E}_O = \vec{E}_{AB} + \vec{E}_{CD}$ $= \frac{\lambda_{AB}}{2\pi\epsilon_0 r_1} (-\hat{i}) + \frac{\lambda_{CD}}{2\pi\epsilon_0 r_2} (-\hat{i})$ $= 2 \times 9 \times 10^9 \times 12 \times 10^{-6} (1 + 1) (-\hat{i})$ $= -4.32 \times 10^5 \hat{i} \text{ N/C}$ $\vec{E}_{P_2} = \vec{E}_{AB} + \vec{E}_{CD}$ $= \frac{\lambda_{AB}}{2\pi\epsilon_0 r_1} (-\hat{i}) + \frac{\lambda_{CD}}{2\pi\epsilon_0 r_2} (\hat{i})$ $= 2 \times 9 \times 10^9 \times 12 \times 10^{-6} \left(-\frac{1}{3} + 1\right) \hat{i}$ $= 1.44 \times 10^5 \hat{i} \text{ N/C}$ <p style="text-align: center;">OR</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p>(i) Calculating the electrostatic potential energy of the system (1)</p> <p>(ii) Calculating the potential energy of the system (2)</p> </div> $(i) U = \frac{1}{4\pi\epsilon_0} \cdot \frac{q_1 q_2}{r}$ $U = \frac{9 \times 10^9 (8 \times 10^{-6})(-4 \times 10^{-6})}{36 \times 10^{-2}}$ $U = -0.8 \text{ J}$ $(ii) U = V_1 q_1 + V_2 q_2 + \frac{1}{4\pi\epsilon_0} \cdot \frac{q_1 q_2}{r}$ $= \frac{9 \times 10^4}{18 \times 10^{-2}} \times 8 \times 10^{-6} + \frac{9 \times 10^4}{18 \times 10^{-2}} \times (-4 \times 10^{-6}) + (-0.8)$ $= 4 - 2 - 0.8$ $U = 1.2 \text{ J}$ | <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1</p> <p>1/2</p> <p>1/2</p> | 3 |
| 26. | <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p>Finding</p> <p>(i) The torque acting on the loop (1)</p> <p>(ii) The magnitude of the net force on the loop (1½)</p> <p style="padding-left: 20px;">The direction of the net force on the loop (½)</p> </div> <p>(i) Since magnetic field produced by wire at the side of loop and the area vector of the loop both are into the plane of the loop. (<math>\vec{A} \parallel \vec{B}</math>)</p> $\vec{\tau} = I \vec{A} \times \vec{B} = 0$ <p>(ii) Magnetic force on side MN and NO are equal in magnitude but opposite in direction, so they cancel each other.</p> <p>Now force on MP and NO are attractive and repulsive respectively.</p> $F_{net} = F_{MP} - F_{NO}$ $F_{net} = \frac{\mu_0}{2\pi} I_1 I_2 l \left( \frac{1}{d_1} - \frac{1}{d_2} \right)$ $I_1 = 2A, I_2 = 1A, l = 10 \times 10^{-2} m, d_1 = 1 \times 10^{-2} m, d_2 = 6 \times 10^{-2} m$ $F_{net} = 2 \times 10^{-7} \times 2 \times 1 \times 10 \times 10^{-2} \left( \frac{10^2}{1} - \frac{10^2}{6} \right)$ $= \frac{20}{6} \times 10^{-6} = 3.34 \times 10^{-6} N$ <p>Loop will be attracted towards wire i.e <math>F_{net}</math> is towards left.</p>                                                           | <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p>                                | 3 |



27.

- (i) Drawing the ray diagram depicting image formation by the combination (1)
- (ii) Calculating the final image distance from  $L_2$  (1)
- (iii) Calculating the magnification (1)

(i)



(ii)  $L = 147 \text{ cm} > f_1 + f_2 = (150 \text{ cm})$

The first image is formed between the focus and lens  $L_2$ .

i.e.  $u_2 < f_2$

$$L = f_1 + |u_2|$$

$$|u_2| = L - f_1 = 147 - 144 = 3 \text{ cm}$$

For  $L_2$

$$u_2 = -3 \text{ cm}, f_2 = 6 \text{ cm}$$

$$v_2 = \frac{u_2 f_2}{u_2 + f_2}$$

$$v_2 = \frac{(-3) \times 6}{-3+6}$$

$$= -6 \text{ cm}$$

Final image is formed at 6 cm from  $L_2$  at left side.

(iii) Magnification,  $m = \frac{\tan\beta}{\tan\alpha}$   
 $= \frac{h/u_2}{h/f_1}$

$$m = \frac{f_1}{u_2}$$

$$m = f_1 \left( \frac{1}{v_2} - \frac{1}{f_2} \right)$$

$$m = 144 \left( \frac{1}{-6} - \frac{1}{6} \right)$$

$$m = -48$$

---

28.

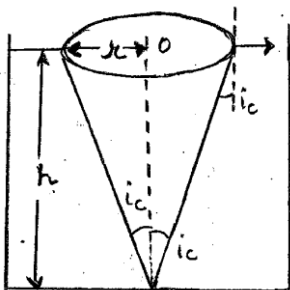
- (a) Finding the voltage (rms) across the capacitor (1)
- (b) Finding  $V_{AB}$  in the given circuit (2)

(a) The diode will conduct for the positive half cycle of AC supply because it is forward biased. For the negative half cycle of AC supply, it is reverse biased and does not conduct. So the output would be half wave rectified output.

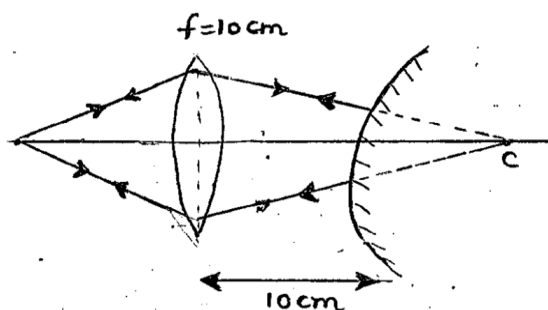
$$V_{rms} = \frac{V_0}{2} = \frac{220\sqrt{2}}{2} = \frac{220}{\sqrt{2}} \text{ volt}$$

Note : Award 1 mark on attempting this part of the question.

(b)

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                           |   |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|---|
|     | $\frac{1}{R_{AB}} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{10} + \frac{1}{10}$ $R_{AB} = 5 \Omega$ $R_{\text{net}} = 5 + 5 = 10 \Omega$ $I = \frac{15}{10} = 1.5 A$ $V_{AB} = IR_{AB}$ $= 1.5 \times 5$ $= 7.5 V$                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | $\frac{1}{2}$<br>$\frac{1}{2}$<br>$\frac{1}{2}$<br>$\frac{1}{2}$          | 3 |
|     | <b>SECTION – D</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                           |   |
| 29. | (i) (B) $-\left(300 \frac{N}{C}\right) \hat{k}$<br>(ii) (B) $\frac{mg}{I} \hat{j}$<br>(iii) (B) describe a circular path.<br>(iv) (a) (A) $0.11 \mu s$<br>OR<br>(b) (D) $4.00 m$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1<br>1<br>1<br>1                                                          | 4 |
| 30. | (i) (C) intensity of the incident radiation.<br>(ii) (C) $2.08 eV$<br>(iii) (A) $\nu_0$<br>(iv) (a) (A) $3.2 \times 10^{-19} J$<br>OR<br>(b) (B) $5.3 \times 10^{14} Hz$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1<br>1<br>1<br>1                                                          | 4 |
|     | <b>SECTION – E</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                           |   |
| 31. | <div style="border: 1px solid black; padding: 10px; margin-bottom: 10px;">           (a) Finding the area of the surface of water (3)<br/>           (b) Drawing the ray diagram (1)<br/>                 Finding the focal length of the convex mirror (1)         </div> <div style="text-align: center;">  </div> $\sin i_c = \frac{1}{n}$ $\tan i_c = \frac{r}{h}$ $r = h \tan i_c \text{ \& } \tan i_c = \frac{1}{\sqrt{n^2-1}}$ $A = \pi r^2 = \pi h^2 \tan^2 i_c$ $A = \frac{\pi h^2}{n^2-1}$ $A = \frac{\pi \times 1}{\frac{16}{9}-1}$ $= \frac{9\pi}{7} = \frac{9 \times 3.14}{7} = 4.04 m^2$ | 1<br><br>$\frac{1}{2}$<br>$\frac{1}{2}$<br>$\frac{1}{2}$<br>$\frac{1}{2}$ |   |

(b)



$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{v} = \frac{1}{10} - \frac{1}{15}$$

$$= \frac{1}{30}$$

$$v = 30 \text{ cm}$$

Radius of curvature of the mirror,

$$R = 30 - 10 = 20 \text{ cm}$$

$$f = \frac{R}{2}$$

$$f = 10 \text{ cm}$$

**OR**

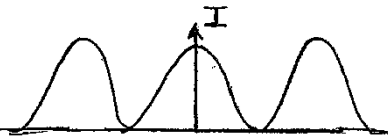
(a) Difference between interference and diffraction (1)

Finding the intensity of light for path difference:

(i)  $\frac{\lambda}{3}$  and (ii)  $\frac{\lambda}{4}$  (1+1)

(b) Calculating the wavelength of light. (2)

(a)

| Interference                                                                                               | Diffraction                                                                                                 |
|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| 1. The width of bright and dark bands is equal.                                                            | 1. The width of the central maxima is twice the width of secondary maxima or minima.                        |
| 2. Intensity of all bright fringes is the same.                                                            | 2. Intensity of bright fringes decreases with distance from the central maxima.                             |
| 3. There is good contrast between bright and dark fringes.                                                 | 3. There is poor contrast between bright and dark fringes.                                                  |
| 4. Intensity distribution curve.                                                                           | 4. Intensity distribution curve                                                                             |
|  <p>Path difference</p> |  <p>Path difference</p> |

$$(i) I = 4I_0 \cos^2 \frac{\phi}{2}$$

$$\Delta x = \frac{\lambda}{3}$$

$$\phi = \frac{2\pi}{\lambda} \times \frac{\lambda}{3} = \frac{2\pi}{3}$$

$$I_1 = 4I_0 \cos^2 \frac{\pi}{3}$$

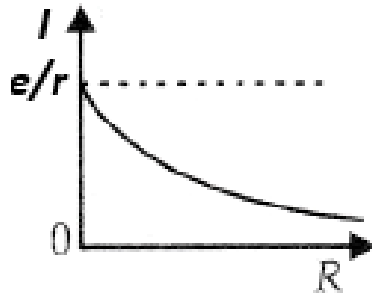
$$I_1 = I_0$$

(Any one correct difference)

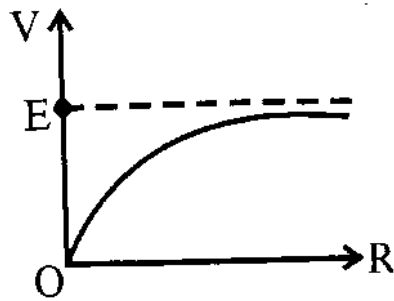


- (a) Drawing the graph showing variation of
- (i) The current (I) in the circuit with (R) (1)
- (ii) The terminal potential difference of the cell with R (1)
- (b) (i) Finding the resistance at 425°C (2)
- (ii) Drawing the graph showing variation of resistance of the heating coil as a function of increase in temperature (1)

(a) (i)



(ii)



(b)

$$\alpha = \frac{R_2 - R_1}{R_1(T_2 - T_1)}$$

$$= \frac{120 - 100}{100(1025 - 25)}$$

$$= \frac{20}{100 \times 1000}$$

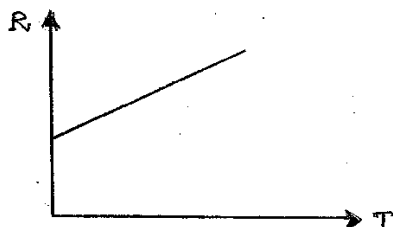
$$\alpha = 2 \times 10^{-4} \text{ } ^\circ\text{C}^{-1}$$

$$R_2 = R_1[1 + \alpha(T_2 - T_1)]$$

$$= 100[1 + 2 \times 10^{-4}(425 - 25)]$$

$$= 100 \times 1.08$$

$$R_2 = 108 \text{ } \Omega$$



1

1

$\frac{1}{2}$

$\frac{1}{2}$

$\frac{1}{2}$

$\frac{1}{2}$

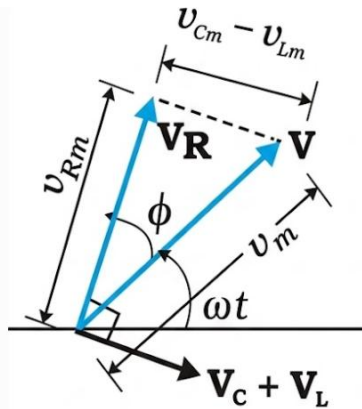
1

5

33.

- (a) Derivation of the expression for impedance in a series LCR circuit (2)  
 Definition of resonance (½)  
 Obtaining the expression for resonant frequency (½)  
 (b) Writing two disadvantages (1+1)

(a)

For:  $V_C > V_L$ 

$$V_{Rm} = I_m R, V_{Cm} = I_m X_C, V_{Lm} = I_m X_L$$

Phasor relation:

$$\vec{V}_L + \vec{V}_R + \vec{V}_C = \vec{V}$$

Using Pythagoras' theorem,

$$V_m^2 = V_{Rm}^2 + (V_{Cm} - V_{Lm})^2$$

$$I_m^2 Z^2 = (I_m R)^2 + (I_m X_C - I_m X_L)^2$$

$$I_m^2 Z^2 = I_m^2 [R^2 + (X_C - X_L)^2]$$

$$Z = \sqrt{R^2 + (X_C - X_L)^2}$$

Resonance is achieved when:

The voltage across the capacitor becomes out of phase with the voltage across the inductor. / The current amplitude becomes maximum. / The impedance becomes minimum.

**(Any one)**

Expression for Resonant Frequency

For  $Z = \text{minimum}$   $X_C = X_L$ 

$$\frac{1}{\omega_0 C} = \omega_0 L$$

$$\omega_0 = \frac{1}{\sqrt{LC}} \quad \text{or} \quad \nu_0 = \frac{1}{2\pi\sqrt{LC}}$$

(b) (i) Heat loss ( $I^2 R t$ ) will be higher.(ii) Voltage drop ( $IR$ ) along the transmission line will be more.

(iii) Installation cost will be higher.

**(Any two)**

½

½

½

½

½

½

1+1

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                         |   |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|---|
|  | OR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                         |   |
|  | <div> <p>(a) Calculating</p> <p>(i) Maximum current drawn (1½)</p> <p>(ii) Flux through the coil when current is zero (1½)</p> <p>(b) Writing two examples (½ + ½)</p> <p>Explaining the process of rotation of armature in brief (½ + ½)</p> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                         |   |
|  | <p>(a) (i) <math>N = 500, A = 25 \times 100 \times 10^{-4} \text{ m}^2, \omega = 60 \text{ rad s}^{-1} B = 0.4 \text{ T}</math><br/> <math>R = 250 \Omega</math><br/> <math>I_0 = \frac{NBA\omega}{R}</math><br/> <math>I_0 = \frac{500 \times 0.4 \times 25 \times 100 \times 10^{-4} \times 60}{250}</math><br/> <math>I_0 = 12 \text{ A}</math></p> <p>(ii) When current through the coil = 0, flux is maximum.<br/> <math>\phi_{\text{max}} = NBA</math><br/> <math>\phi_{\text{max}} = 500 \times 0.4 \times 2500 \times 10^{-4}</math><br/> <math>\phi_{\text{max}} = 50 \text{ Wb}</math></p> <p>(b) Hydroelectric Generator<br/> The mechanical energy required for rotation of the armature is provided by water falling from a height (dams).<br/> Thermal Generator<br/> Water is heated to produce steam using coal or other sources. The steam at high pressure produce the rotation.<br/> Nuclear Power Generator - Nuclear fuel is used to rotate the armature.</p> <p>(Any two)</p> | <p>½</p> <p>½</p> <p>½</p> <p>½</p> <p>½</p> <p>½</p> <p>½</p> <p>½</p> |   |
|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                         | 5 |