a. A L-C-R series circuit consists of an inductor (30 mH), a capacitor($10\ \mu F$), and a resistor ($R = 25\Omega$ connected in series to a source of alternating voltage ($240\ \text{V}; 50\ \text{Hz}$).

i. Draw phasor diagram to show the lagging or leading relationship of voltage and current in the circuit. 2

ii. Calculate the current in the circuit and voltmeter reading across the capacitor. 3

b. What is Wattles current? 1

c. What will be reactance of capacitor when connected to dc circuit? What is the consequence? 2

11. **a**. Write the vector form of Lorentz force. 1

b. What is cross-field? Describe how will you determine the specific charge of an electron 3

c. An electron beam passes through a magnetic field 0f 2×10^{-3} T and an electric 3.4×10^{4} V/m both acting simultaneously.

i. If the path of the electron remains undeflected, calculate the speed of electrons. 2

ii. If the electric field is removed, what will be the radius of the circular path?2

OR

a. In the latest electronic devices, there is no need of external voltage stabilizer.

i. Name the Circuit component that can be used as voltage stabilizer with appropriate circuit symbol. 1

ii. Does this device work in a.c.? Explain. 2

iii. Explain the necessary theory for the voltage stabilization with necessary circuit diagram. 2

b. What are the basic components that convert a.c. into d.c.? Explain construction and working of full wave rectifier. 3

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Model Set (B) *Sub. Code:* **1021**

NEB - GRADE XII
2080 (2023)
Physics

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.

Time: 3 Hrs. **Full Marks: 75**

Attempt all the questions

[GROUP A] $[11 \times 1 = 11]$

Rewrite the correct options of each questions in your answer sheet.

1. For a body undergoing rotational motion, its radius of gyration depends upon,
a. Shape b. Size
c. Axis of rotation ***d***. All of the above

2. A particle executing SHM with time period T. What will be the time taken by it to complete $3/8$ oscillation starting from its extreme position?
a. $\frac{T}{3}$ b. $\frac{3T}{12}$ ***c***. $\frac{5T}{12}$ d. $\frac{5T}{8}$

3. The ratio of terminal velocities of two drops of radii R and $R/2$ is,
a. $1:2$ b. $2:1$ c. $1:4$ d. $4:1$

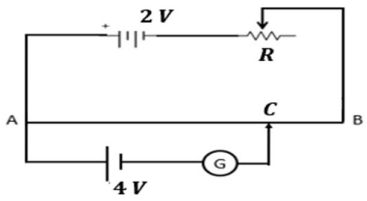
4. An ideal engine working between temperature T_1 and T_2 has efficiency $\boldsymbol{\eta}$. If both the temperatures are raised by $100K$ each, the efficiency of the engine will be,
a. $\boldsymbol{\eta}$ ***b***. $> \boldsymbol{\eta}$ c. $< \boldsymbol{\eta}$ d. depends upon working substance

5. When a gas undergoes adiabatic expansion, its internal energy:
a. increases ***b***. decreases c. remains same d. equals zero

6. The distance between two particles in a wave motion (wavelength= λ) vibrating in same phase is,
a. $\frac{\lambda}{4}$ b. $\frac{\lambda}{2}$ c. $\frac{3\lambda}{4}$ ***d***. λ

7. An open organ pipe and a close organ pipe resonate with same tuning fork. The ratio of the lengths of open pipe to close pipe is:
a. $1:2$ ***b***. $2:1$ c. $1:4$ d. $4:1$

8. The given diagram shows the experimental arrangement for the determination of emf of a cell using a potentiometer. With the increase in value of series resistor ***R*,** the shift in the balanced point ***C*** will be,



a. Towards A b. Towards B
c. Remains constant ***d***. Balance point cannot be determined