

## Model Question -2

Grade: XII Subject: Physics (102)

Full marks: 75 (11 marks Obj+ 64 marks Sub)

Time: 3 Hours

Attempt all the questions:

### Group "A"

Rewrite the correct option in your answer sheet:

11X1=11

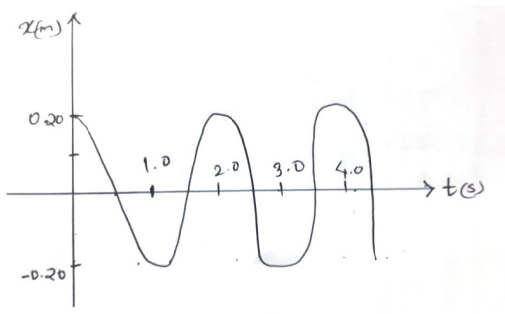
- 1) The product of moment of inertia and angular acceleration gives
  - a. linear momentum
  - b. angular momentum
  - c. Torque
  - d. Force
- 2) If 1500 Cal of heat is supplied to a system and 1000J of work is done. What is the increase in internal energy?
  - a. 2000 J
  - b. 5000 J
  - c. 4300 J
  - d. 6000 J
- 3) In an open end pipe, first overtone is produced when the length of pipe is
  - a.  $\frac{\lambda}{4}$
  - b.  $\frac{\lambda}{3}$
  - c.  $\frac{\lambda}{2}$
  - d.  $\lambda$
- 4) The phenomenon of interference is based on the principle of conservation of
  - a. energy
  - b. momentum
  - c. momentum
  - d. All of these
- 5) Electromotive force is most closely related to
  - a. electric field
  - b. magnetic field
  - c. wavelength
  - d. All of these
- 6) Susceptibility above Curie temperature is valid for
  - a. Ferrimagnetic material
  - b. Paramagnetic material
  - c. Diamagnetic material
  - d. Ferrimagnetic material
- 7) A hole in a p-type semiconductor is
  - a. an excess electron
  - b. a missing electron
  - c. a missing atom
  - d. a donor level
- 8) The ratio of de Broglie wavelength of proton and  $\alpha$  - particle having same kinetic energy is
  - a. 1:4
  - b. 1:2
  - c. 2:1
  - d. 4:1
- 9) Which of the following is the slowest?
  - a. P waves
  - b. S waves
  - c. Surface tension
  - d. Tsunami
- 10) If the liquid does not wet the solid surface, the angle of contact is
  - a. zero
  - b. acute
  - c.  $90^\circ$
  - d. obtuse
- 11) In the wave equation  $y = 10^{-4} \sin\left(100t - \frac{x}{10}\right)$ . The velocity of the wave will be
  - a.  $100 \text{ ms}^{-1}$
  - b.  $250 \text{ ms}^{-1}$
  - c.  $750 \text{ m/s}$
  - d.  $1000 \text{ sec}$

### Group "B"

Short answer questions:

8X5=40

- 1)
  - a) Define Simple harmonic motion and state its equation. 2
  - b) The displacement of an oscillating object as a function of time is shown in figure:



Calculate its:

- i) Time period
- ii) Frequency
- iii) Amplitude

3

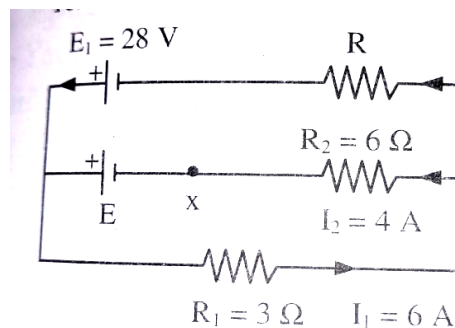
OR

- a) Describe the Bernoulli's equation and explain its use. 2
  - b) Explain the equation of continuity. 1
  - c) Air is streaming past a horizontal air plane wing such that its speed is 129 m/s at the lower surface. If the density of air is  $1.3 \text{ kg/m}^3$ . Find the difference in pressure between the top and bottom of the wing. 2
- 2)
- a) Explain the meaning of work done by the system and work done on the system. 1
  - b) Describe how work done by gas during expansion can be calculated from indicator (p-v) diagram. 2
  - c) A tyre pumped to a pressure of 6 atmosphere bursts suddenly. Calculate the temperature of escaping air. Given initial room temperature is  $150^\circ \text{C}$  and  $\gamma$  for air is 1.4. 2
- 3)
- a) Write Newton's equation for velocity of sound in air. 1
  - b) What correction was applied by Laplace and why? 2
  - c) At normal temperature and pressure, 4g of helium occupies a volume of 22.4 litre. Determine the speed of sound in helium. For helium,  $\gamma = 1.67$  and 1 atmospheric pressure =  $1.05 \times 10^5 \text{ N/m}^2$  2
- 4)
- a) What do you mean by interference of light? 1
  - b) Explain the terms constructive and destructive interference. 2
  - c) In a Young's experiment, light of wavelength  $6 \times 10^{-7} \text{ m}$  is used, the set are 0.6 mm apart and the bright bands formed on a screen at 0.8 mm apart. Calculate the distance of the slits from the screen. 2
- 5)
- a) Describe principle of potentiometer.
  - b) The potentiometer wire must be long and of uniform thickness. Why? Explain.
  - c) When a cell of emf 1.5V is connected to the potentiometer wire, the balancing length is found to be 650 cm, when a cell of unknown emf is connected to the potentiometer, the balancing length is found to be 468 cm. What is the emf of the second cell?

OR

Two batteries and three resistors are connected in a circuit as shown in figure. Find

- a) The current in resistor R. 1
- b) The unknown emf E 1
- c) The resistance R 1
- d) If the circuit is broken at point X, what is the current in the resistor R. 2



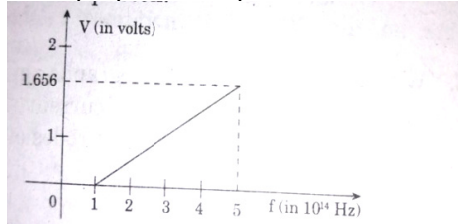
6)

- a) Sketch magnetic field lines around a straight current carrying conductor and long solenoid. 1

- b) Discuss force on a current carrying conductor placed in uniform magnetic field. 2  
 c) A horizontal wire 0.5 m long and mass 50 g is placed uniform magnetic field of 0.2 T perpendicularly. Calculate the current in the wire to make it self supporting? ( $g = 10\text{m/s}^2$ ) 2

7)

- a) State Planck's theory of quantum radiation. 1  
 b) The plot of stopping potential versus, the frequency of light used in an experiment on photoelectric effect is shown in figure. Calculate. 2  
 i) Work function  
 ii) The ratio  $\frac{b}{e}$   
 c) Write properties of photon.



2

8)

- a) What is Zener diode? 1  
 b) Plot forward and reverse characteristics of semiconductor diode including the concept of Zener diode. 1  
 c) Explain the operation of AND, OR and NAND gates. 3

### Group "C"

#### Long answer questions:

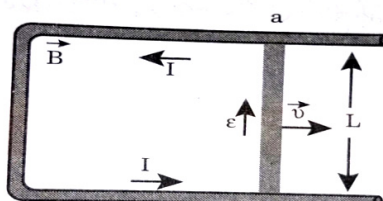
3X8=24

9)

- a) What is meant by the moment of inertia of an object about an axis? 1  
 b) A uniform circular disc of  $(I^2) = \frac{MR^2}{2}$  mass 20 kg and radius 0.15 m is mounted on a horizontal cylindrical axle of radius 0.015 m and negligible mass. Neglecting frictional losses in the bearings. Calculate  
 i) The angular velocity acquired from rest by the application for 12 second of a force of 20N tangential to the axle. 3  
 ii) The KE of the disc at the end of this period. 1  
 iii) The time required to bring the disc to rest if a breaking force of 1N were applied to its rim. 3

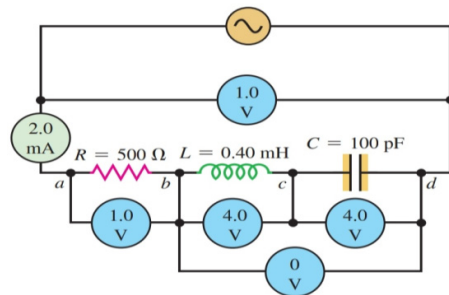
10)

- a) State Faraday's laws of electromagnetic induction. 2  
 b) How would you determine the direction of induced current? 1  
 c) In figure, a rod with length  $L = 85.0$  cm moves in a magnetic field  $B = 0.850$  T. the emf induced in the moving rod is 0.620V.  
 i) What is the speed of the rod? 1  
 ii) If the total circuit resistance is  $0.750 \Omega$ . What is the induced current? 1  
 iii) What force (magnitude and direction) does the field exert on the rod as a result of this current? 2



OR

- a) What do you mean by resonance in series L-C-R circuit? 2
- b) The series L-C-R circuit is similar to arrangement that are sometimes used in radio tuning circuit. The circuit is connected to the terminal's of an ac source with constant rms terminal voltage of 1.0V and a variable frequency. Find
- i) The resonance frequency. 1
- ii) The inductive reactance, the capacitive reactance and impedance at the resonance frequency. 2
- iii) The rms current at resonance. 1
- iv) The rms voltage across each circuit element at resonance. 2



11)

- a) State the laws of radioactive disintegration. 2
- b) Differentiate types of radiations coming from radioactive sources. 1
- c) A radioactive element of atomic weight 99 has a half life of 6 hours. Find the activity in a solution containing 1 gram of this element in the beginning, and after 1 hour. The Avogadro's number is  $6.023 \times 10^{23} \text{ mol}^{-1}$ . 3
- d) Explain the meaning of natural and artificial radioactivity. 2