



21718

17202

**2 Hours / 50 Marks**

Seat No.

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- Instructions :**
- (1) *All questions are **compulsory**.*
  - (2) *Answer **each** next main question on a **new** page.*
  - (3) *Illustrate your answers with neat sketches **wherever** necessary.*
  - (4) *Figures to the **right** indicate **full** marks.*
  - (5) *Assume suitable data, if **necessary**.*
  - (6) *Use of Non-programmable Electronic Pocket Calculator is **permissible**.*
  - (7) *Mobile Phone, Pager and any other Electronic Communication devices are **not permissible** in Examination Hall.*

**Marks**

**1. Attempt any nine :**

**18**

- a) State the equations of motion for a body falling freely under gravity with meaning of each symbol.
- b) Define power. State its S.I. Units.
- c) Define impulse and impulsive force.
- d) An object is projected upwards making an angle of  $35^\circ$  with horizontal with an initial speed of 45 m/s. Calculate the time required for object to reach the ground.
- e) State any two properties of ultrasonic waves.
- f) Calculate the amount of heat generated when current of 1-5 A flows for 10 minutes through resistance of  $21 \Omega$ . (Given  $J = 4200 \text{ J/Kcal}$ ).
- g) Distinguish between Seebeck effect and Peltier effect (any two points).
- h) State Planck's hypothesis.
  - i) Draw neat labelled diagram of photo electric cell.
  - j) State any two properties of X-rays.
  - k) Give any two engineering applications of X-rays.
  - l) Explain the term population inversion.

**P.T.O.**

**2. Attempt any four :**

- a) Distinguish between centripetal force and centrifugal force. (any four points)
- b) A train crosses a tunnel in 20 sec. At the entry of the tunnel its velocity is 72 km/hr and at the exit of tunnel its velocity is 36 km/hr. Find length of tunnel.
- c) i) State the law of conservation of momentum for a system of two colliding bodies. Also state its mathematical formula.  
ii) A bullet of mass 40 gm is fired with a muzzle velocity of 500 m/sec. from a gun of mass 4 kg. Calculate the recoil velocity of the gun.
- d) Explain the liquid penetration testing method for the detection of surface discontinuities with the help of principle, diagram and experimental procedure.
- e) State any four advantages of non-destructive testing of material.
- f) Explain the production of ultrasonic waves by piezoelectric method.

**3. Attempt any four :****16**

- a) Define thermo emf. State any three factors on which thermo emf is dependent.
  - b) Explain graphically the variation of thermo emf with temperature and hence define neutral temperature and inversion temperature.
  - c) i) Define the terms :
    - 1) angular velocity
    - 2) angular accelerationii) Derive the relation between linear velocity and angular velocity of a body.
  - d) The photoelectric work function of a certain metal is 3 eV. Calculate its threshold frequency and threshold wavelength.  
Planck's const,  $h = 6.6 \times 10^{-34}$  J-sec.
  - e) Find the minimum wavelength and maximum frequency of X-rays produced by an X-ray tube working on 50 Kv. ( $h = 6.62 \times 10^{-34}$  J-sec, velocity of light,  $c = 3 \times 10^8$  m/s and  $e = 1.6 \times 10^{-19}$  C)
  - f) State any four properties of LASER.
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