21718

2 Hours / 50 Marks   Seat No. ☐☐☐☐☐☐☐☐

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 of the following :**   **18**

(a)   Define :

(i)   Angular displacement

(ii)   Angular velocity

(b)   State Newton's second law of motion.

(c)   Define ultrasonic waves and infrasonic waves.

(d)   If the crack is on the surface of job, then which method is used ?

(e)   "X-rays are specifically used to detect the position of bullet inside human body." Give reason.

(f)   State Inverse square law of photometry. Write its mathematical formula.

(g)   Define photoelectric effect.

(h)   State any two engineering applications of X-rays.

(i)   Define kinetic energy. State its equation & SI unit.

(j)   State any two factors affecting indoor lighting system.

    (k)   The photoelectric work function of a certain metal is 2.5 eV. Calculate its threshold frequency if Planck's constant is 6.625×10^{-34} J-sec.

    (l)   A ball is thrown with a velocity of 55 m/sec making an angle of 38° with the horizontal. Calculate the range covered by the ball.

2. **Attempt any FOUR of the following :**   **16**

    (a)   Define :

        (i)   Circular motion

        (ii)   Trajectory

        (iii) Height of projectile

        (iv) Time of flight

    (b)   (i)   A lift of mass 1500 kg is being raised with a uniform velocity of 1.3 m/sec. Find the power involved in it.

        (ii)   A body of mass 90 kg is raised to a height of 850 cm from ground. Calculate its potential energy.

    (c)   Explain piezoelectric method for production of ultrasonic waves with diagram and procedure.

    (d)   A car has initial velocity of 3 m/s. It accelerates for 12 seconds at the rate of 3.5 m/s^2. Determine the final velocity and the distance travelled during this time.

    (e)   Name any four NDT methods used in industry. State any two criteria for selection of NDT method.

    (f)   Explain LPT method with the help of principle, diagram and experimental procedure.

3. **Attempt any FOUR of the following :** 16

   (a) State the requirements of good acoustics of building. (any four points)

   (b) Explain principle, construction and working of Bunsen's photometer.

   (c) State any four characteristics of photoelectric effect.

   (d) (i) The energy of X-ray spectrum is 4.4 eV. Find its wavelength.

   (Given : Planck's constant, $h = 6.63 \times 10^{-34}$ J-sec; speed of light, $c = 3 \times 10^8$ m/sec)

   (ii) Determine the operating voltage of an X-ray tube which emits X-rays of wavelength 0.38 Å.

   (e) Define echo, reverberation. State Sabine's formula for reverberation time. Explain the terms used in it.

   (f) (i) A stone is released with zero velocity from the top of the tower. If the stone reaches ground in 5 seconds, find the height of the tower.

   (ii) A body moves along a circular path of radius 60 cm at 3 revolutions / sec. Calculate its linear speed.

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