

Time: 2Hours 40mins  
Max Marks: 40

### Section "B"

Q. No.2 Attempt any 10 parts from this question. Each part carries 4 marks.

- i. Show that the given equations are dimensionally correct (a)  $T=2\pi (L/g)^{1/2}$  (b)  $S=V_0t + 1/2at^2$
- ii. A magnifying glass of focal length 6cm is used to see a small specimen. The least distance of distinct vision of the observer is 25cm. What is the magnifying power of the lens?
- iii. A diver leaps from a tower with initial horizontal velocity component of 7m/s and upward velocity component of 5m/s. Find the component of his velocity. **OR** Is it possible for a body to have acceleration when (a) constant velocity (b) constant speed? *after quarter of a min*
- iv. Prove that power is scalar product of force and velocity. **OR** Write down the expression for the acceleration representing simple harmonic motion. Would you keep the amplitude of a simple pendulum small or large? Why?
- v. A body hanging from a spring is set into motion and the period of oscillation is to be 0.8sec. After the body has come to rest it is removed. How much shorter will the spring be when it comes to rest?
- vi. A horse pull a cart horizontally with a force of 40N at an angle of 25 and moves at a speed of 15m/s. How much work will the horse do in minutes? What is the power output of the horse? Give your answer in horse power. **OR** What is Doppler Effect? Describe the expression for the heard frequency of any case.
- vii. At what suitable angle is the maximum height of the projectile 1/3 Of its range? **OR** What are the defects in the lenses and how these defects are removed?
- viii. Determine the unit vector perpendicular to the plane of  $A=2i -6j -3k$  and  $B=4i +3j -k$ . And Under what condition  $|A \times B| = A \cdot B$ ?
- ix. A uniform ladder having length "L" and weighing 50N, rest against a smooth vertical wall. If the coefficient of friction between the ladder and the wall is 0.40, find the minimum angle, such that the ladder may not slip.
- x. How many times in a second a spaceship of diameter 30m needs to be rotated in order to create the similar gravity as experienced on Earth.
- xi. At what distance from the centre of the Earth does the gravitational acceleration have one half the value that it have on the Earth's surface?
- xii. With the help of a diagram show the forces acting on a simple pendulum. Hence derive the expression for its time period. **OR** An astronomical telescope has a length of 105cm, and its magnification is 6. Determine the power of objective and eye piece.

1 minute

- xiii. An ambulance travels down a highway at a speed of 75km/h. Its siren emits sound at a frequency of 400Hz. What is the frequency heard by a person in a car travelling at 55km/h in the opposite direction (a) as car approaches the ambulance and (b) as car moves away from the ambulance?
- xiv. How many fringes will pass a reference point if the moveable mirror of s Michelson's interferometer is moved by 0.08mm? the wavelength of light used is  $5800\text{\AA}$
- xv. A wooden block of mass 10kg is suspended by a long cord, that can swing as a pendulum. A 50g bullet is fired which lodges itself into the block. Due to the impact the centre of gravity of the block is raised by 10cm. What was the initial speed of the bullet?

### Section "C" (28 Marks)

Note: attempt any two questions. Draw diagram where necessary.

- Q3(a): How many methods of addition of vectors are given in your book. Write their names. Describe the addition of two vectors  $A_1$  and  $A_2$  making angle  $\Theta_1$  and  $\Theta_2$  with positive x-axis respectively by rectangular component method.
- (b) Derive the expression for the acceleration of a body of mass  $m$  moving down in a plane inclination  $\Theta$  having friction  $f$ . OR One vertically and one horizontally, derive the expression for the tension and acceleration of the bodies.
- Q4(a): An object is thrown in air at an angle  $\Theta$  with the horizontal velocity  $V_0$  derive the relation (i) total time of flight (ii) horizontal range of projectile. OR Discuss the Newton's formula for speed of sound and the flaw in it. In what way did the Laplace correct the formula?
- (b) Derive the expression for the absolute gravitational potential energy. OR What are the beats? How are they produced, obtain an expression for the beats frequency.
- Q5(a): Describe young's double slit experiment to obtain expression for path difference and fringe spacing. OR What are stationary waves? Discuss the vibrations in a stretched string when it vibrates in (i) one loop (ii) two lppos (iii) three loops. Also derive the formula for the frequency of the loops.
- (b) with the help of ray diagram explain working of a simple microscope or compound microscope. Derive relation for its magnifying power.