**QP CODE: 24801180**

24801180

**Reg No :** .....

**Name :** .....

# INTEGRATED MSC DEGREE EXAMINATION, FEBRUARY 2024

## First Semester

INTEGRATED MSC BASIC SCIENCE-PHYSICS

## CORE - IPH1CR02 - MECHANICS AND PROPERTIES OF MATTER

2021 Admission Onwards

7B4D2EBF

Time: 3 Hours | Weightage: 30

### Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. Which describes the order of the signs of an ordered pair in the third quadrant?
2. Define componenets of a vector.
3. What are the limiting values of r,θ, and ø in spherical polar coordinate system?
4. Explain the principle of flywheel.
5. What is working stress?
6. Why hollow cylinders are preferred over solid ones in shafts?
7. What is surface tension and surface energy?
8. What is meant by resonance?
9. What are the effects produced by damping?
10. Distinguish between forced oscillations and natural oscillations.

(8×1=8 weightage)

### Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. w = (4.52 ± 0.02) cm, x = (2.0 ± 0.2) cm. Find z = w x and its uncertainty
12. Calculate the line integral of the function $A=y^2i+2x(y+1)j$ from the point (1,1,0) to (2,1,0) and (2,1,0) to (2,2,0)
13. A particle of mass m moving in a circular orbit of radius r has angular momentum J about its centre. Calculate the kinetic energy of the particle in terms of J, m and r.

14. A bar of length 60 cm, breadth 2 cm and thickness 6 mm is fixed horizontally at one end. A load of 500 g at a distance 40 cm from the fixed end. Find the depression at the end. Given Y = 1.0 x $10^{10}Nm^{-2}$.

15. At a dock, a metal plate is completely submerged and attached to an underwater wall. The side of the metal plate is exposed to the ocean, and to the flow of water caused by tides. The plate has dimensions of height=2.3 m and width=19 m. If the current has a speed of v=3 m/s at maximum tidal flow, how much force will the water exert on the metal plate?

16. Discuss relations between angular and linear quantities.

17. Derive differential equation for wave motion.

18. Explain production of ultrasonic waves by Peizo Electric Crystal Method.

(6×2=12 weightage)

**Part C (Essay Type Questions)**

*Answer any **two** questions.*

*Weight **5** each.*

19. Check whether the force $F=(2xy+z^2)i+x^2j+2xzk$ is conservative. If so calculate the work done on a particle in moving it from (0,1,2) to (5,6,8).

20. Define moment of inertia and radius of gyration. Explain their physical significance. State and explain the laws of parellel and perpendicular axis theorem.

21. Obtain the Poiseuille's equation for the volume of liquid flowing through a pipe.

22. Set up the differential equation for a forced harmonic oscillator. Explain the contribution of the verious terms involved. Obtain the condition for resonance.

(2×5=10 weightage)