

2023

B.Sc. (Honours)

B.Sc. First Semester End Examination - 2023

PHYSICS (Minor)

PAPER - MI-101T

Full Marks : 40

Time : 2 hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

Group - A

1. Answer any five questions 5×2=10
- (a) Write down the Einstein's postulate in special theory of relativity. 2
- (b) Find $\bar{\nabla}\phi$ at (4,-1,1) where $\phi(x,y,z)=xy^2z^3$ 2
- (c) For the position vector $\bar{r} = \hat{i}x + \hat{j}y + \hat{k}z$ show that $\bar{\nabla} \times \bar{r} = 0$ 2
- (d) Explain Kepler's law of planetary motion. 2

(Turn Over)

(2)

- (e) At what speed does a meter stick move if its length is observed to shrink is 0.5 m. 2
- (f) Write the difference between impulse of force and impulsive force. 2
- (g) Prove that $E^2 = p^2 c^2 + m_0^2 c^4$ where E is energy of the particle, p is momentum and m_0 is rest mass of particle. 2
- (h) What is stress? 2

Group-B

Answer any four question.

4×5

2. Show that, $\frac{\vec{r}}{r^3}$ is an ir-rotational and also solenoidal vector field. 3+2
3. State that proved law of conservation of angular momentum with example. 1+3+1
4. Calculate torsional rigidity of a solid cylinder on wire. 5
5. Calculate kinetic energy of a rotating body. Calculate limiting values of poisson's ratio. 2+3
6. Show that a central force is conservative i.e. $\vec{\nabla} \times \vec{F} = 0$ and the angular momentum of a body under the influence of central force is const of motion. 5

(3)

7. (i) Solve : $\frac{dy}{dx} = \frac{x(2 \log x + 1)}{\sin y + y \cos y}$
- (ii) Write the order and degree of the following differential equ.ⁿ

$$\cos x \frac{d^2 y}{dx^2} + \sin x \left(\frac{dy}{dx} \right)^2 + 8y = \tan x \quad 3+2$$

Group - C

Answer any one question :

1×10=10

8. (a) Prove that law of conservation of linear momentum from Newton's third law of motion.
- (b) Solve : $y \frac{d^2 y}{dx^2} = \left(\frac{dy}{dx} \right)^2$
- (c) Prove by vector method, 'the diagonal of a parallelogram bisects each other'. 3+3+4
9. (a) Find the gravitational intensity and potential at any point on the surface of the spherical shell having radius R. 3+3
- (b) Calculate work done due to longitudinal strain.