(6 pages) **Reg. No. :** .....

Code No. : 40555 E **Sub. Code : SMPH 11**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2019.

First Semester

Physics — Main

MECHANICS AND RELATIVITY

(For those who joined in July 2017 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

1. A vector field which can be expressed as gradient of scalar field is called

   (a) Lamellar (b) Curl

   (c) Non-curl (d) Scalar

2. The integration of vector along a curve is known as

   (a) Surface integral (b) Line integral

   (c) Volume integral (d) Space integral

3. The working of a rocket is based on

   (a) Newton's I law

   (b) Newton's II law

   (c) Newton's III law

   (d) None

4. Kinetics deals with the relationship between the motion of bodies and

   (a) time (b) force

   (c) position (d) direction

5. The impulse of a constant force is

   (a) $m \times a \times t$ (b) $m \times a$

   (c) $m \times t$ (d) $m \times f$

6. The unit of change of momentum is

   (a) N/S (b) NS

   (c) NS^2 (d) N/S^2

7. In pitot tube the velocity of flow of gas is

(a) $V_1 = \frac{2(P_2 - P_1)}{P}$

(b) $V_1 = 2(P_2 - P_1)$

(c) $V_1 = \frac{\sqrt{2}(P_2 - P_1)}{P}$

(d) $V_1 = P_2 - P_1$

8. The centre of pressure of the plane area is

(a) $\frac{\int h^2 \rho g ds}{\int h ds}$ (b) $\frac{h^2 \rho g ds}{h ds}$

(c) $h^2 \rho g ds \times h ds$ (d) $h^2 \rho^2 g^2 ds \times h ds$

9. Acceleration is invariant under

(a) Newton concept

(b) Galileon transformation

(c) Einstein's theory

(d) None

10. Variation of mass with velocity is

(a) $m = m_0$ (b) $m = c^2 - v^2$

(c) $m = \frac{m}{\sqrt{1 - \frac{v^2}{c^2}}}$ (d) None

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Express the magnitude $a \times b$ in terms of scalar products.

Or

(b) Write the relation between line integral and curl.

12. (a) State and prove work energy theorem.

Or

(b) Describe the central field motion.

13. (a) Explain moment of inertia of a solid cylinder.

Or

(b) Discuss briefly processional motion.

14. (a) Explain the determination of metacentric height of a ship.

Or

(b) Describe the venturimeter with a diagram.

15. (a) Explain the relativistic addition of velocities.

Or

(b) Discuss briefly gravity waves.

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Explain divergence and curl of vector point function.

Or

(b) State and prove Gauss divergence theorem.

17. (a) State and explain law of conservation of linear momentum.

Or

(b) State and prove Kepler's second and third laws.

18. (a) Explain the moment of inertia and radius of gyration.

Or

(b) Explain the theory of equivalent simple pendulum.

19. (a) Define centre of pressure. Write the determination of centre of pressure.

Or

(b) Explain the Pitot's tube.

20. (a) Explain Michelson Morley experiment.

Or

(b) Prove that $E = mc^2$. Write relation between total energy, restmass energy momentum.

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