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

Code No. : 41313 E **Sub. Code : SMPH 11**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2018.

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. The gradient of a scalar point function is a
   (a) vector (b) scalar
   (c) 0 (d) none

2. Angular momentum is a ———————quantity.
   (a) vector
   (b) scalar
   (c) mixed vector and scalar
   (d) none

3. The rocket is based on the principle of law of conservation of
   (a) energy
   (b) momentum
   (c) angular momentum
   (d) none

4. According to Kepler's second law, when the planet is nearer to the sun, it moves ———————.
   (a) faster (b) slower
   (c) rest (d) none

5. The moment of inertia (I) of a plane lamina about an axis perpendicular to its plane is
   (a) I = Ix + Iy (b) I = Ix - Iy
   (c) I = Ix. Iy (d) none

6. The moment of inertia of a solid sphere about its diameter is
   (a) $\frac{2}{5}MR^2$ (b) $\frac{2}{10}MR^2$
   (c) $\frac{7}{5}MR^2$ (d) None

Nesamony Memorial Christian College, Marthandam

7. The venturimeter works on the principle of

(a) Bernoulli's theorem

(b) Boyle's Law

(c) Newton's Third law

(d) None

8. For a streamline motion of a liquid the _____ remains constant

(a) potential energy (b) kinetic energy

(c) thermal energy (d) pressure energy

9. The mass of an object travelling with velocity of light will be

(a) infinity (b) zero

(d) 100 kg (d) none

10. The relation for mass (m) of a particle moving with relativistic velocity v, is

(a) $\dfrac{m_0}{\sqrt{1-\frac{v^2}{c^2}}}$ (b) $\dfrac{m_0}{\sqrt{1+\frac{v^2}{c^2}}}$

(c) $l_0)\ \dfrac{m_0}{\sqrt{1-\frac{c^2}{v^2}}}$ (d) 0

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Prove that $\nabla.\bar{r} = 3\ \left(\bar{r} = x\hat{i} + y\hat{j} + z\hat{k}\right)$.

Or

(b) Find the value ∇r (Where $r^2 = x^2 + y^2 + z^2$.

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

Or

(b) Discuss the two body problem and define reduced mass.

13. (a) Define (i) moment of inertia and (ii) Radius of gyration.

Or

(b) Obtain an expression for the acceleration of a body rolling down an inclined plane.

14. (a) State and explain equation of continuity.

Or

(b) State and explain Bernoulli's theorem.

Nesamony Memorial Christian College, Marthandam

15. (a) Discuss any one of the experiment explaining time dilation.

Or

(b) Obtain Einstein's Mass — energy relation.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) State and prove Gauss divergence theorem.

Or

(b) State and prove Stokes theorem.

17. (a) What is meant by a conservative force.? Show that if the force between two bodies is of a central kind, it is also conservative.

Or

(b) What is centre of mass? Find the total linear momentum of a system of particles about the centre of mass.

18. (a) Obtain the expression for the kinetic energy of rotating body.

Or

(b) Explain the working of a Gyrostat. Give any two applications of it.

19. (a) State law of floatation. Explain the determination of metacentric height of a ship.

Or

(b) Explain the working of Venturimeter.

20. (a) Describe the Michelson Morley experiment.

Or

(b) Derive the Lorentz transformation equations.

———————

Nesamony Memorial Christian College, Marthandam