



B.Sc. DEGREE EXAMINATION – PHYSICS

SECOND SEMESTER – **APRIL 2019**

16/17/18UPH2MC01– MECHANICS

Date: 04-04-2019
Time: 01:00-04:00

Dept. No.

Max. : 100 Marks

Part – A

Answer ALL Questions

(10 x 2 = 20 marks)

1. State Newton's law of equation of motion.
2. A block of mass 2 kg placed on a long frictionless horizontal table is pulled by a constant force F . It is found to move 10 m in the first 2 seconds. Find the magnitude of F .
3. What is the consequence of law of conservation of energy?
4. Define angular momentum. Give its unit.
5. State the significance of equation of motion.
6. How is angular momentum related to torque?
7. What do you mean by the position of stable equilibrium?
8. State the Kepler's laws of planetary motion.
9. What is meant by longitudinal Doppler effect?
10. State the postulates of special theory of relativity.

Part – B

Answer ANY FOUR Questions

(4 x 7.5 = 30 marks)

11. Deduce the force acting on a charged particle moving under the action of electric and magnetic fields.
12. Derive an expression for torque produced by gravity about an arbitrary point other than center of mass. Also evaluate the total angular momentum of such a body.
13. Derive the expression for acceleration of a body rolling down an inclined plane without slipping. Find the acceleration in such a situation for solid sphere and spherical shell.
14. Obtain the period of simple harmonic oscillation of a loaded spring by energy method.
15. What are Lorentz transformation equations and derive the same for translation about X-axis.

16. Set up the equation of motion of a particle of mass m in an inverse square force field and prove the law of conservation of angular momentum in this case.

Part – C

Answer ANY FOUR Questions

(4 x 12.5 = 30 marks)

17. (a) Discuss the motion of particle projected at an angle to the horizontal under uniform gravitational field. **(10)**
- (b) A helicopter on flood relief mission, flying horizontally with a speed of u at an altitude H , has to drop a food packet for a victim standing on the ground. At what distance from the victim should the packet be dropped? The victim stands in the vertical plane of the helicopter's motion. **(2.5)**
18. (a) Discuss the theory of direct elastic collision of two smooth spheres. Find the loss of kinetic energy due to this collision. **(8)**
- (b) A smooth sphere of mass 4 kg moving with a velocity of 8 ms^{-1} impinges on a smooth sphere of mass 5 kg moving in the same direction with a velocity of 4 ms^{-1} . Find the velocities of the spheres after impact. Calculate also the loss of kinetic energy due to impact and the impulse of the blow on the sphere of smaller mass. Given co-efficient of restitution is equal to 0.5 . **(4.5)**
19. State and prove (i) perpendicular axes theorem and (ii) parallel axes theorem for a plane lamina and a circular disc.
20. Prove that the discharge is oscillatory and undamped in a circuit containing an inductance and a capacitor.
21. Explain the Michelson-Moreley experiment and discuss its negative result. **(10+2.5)**
22. (a) Explain the concept of addition of velocities. **(2.5)**
- (b) Obtain the expression for the distance of closest approach of proton to a nucleus. **(10)**