

- 30) Draw the position time graph for motion with
  - i) Positive acceleration
  - ii) negative acceleration
  - iii) zero acceleration
- 31) Define average acceleration. Write the expression for average acceleration in terms of its rectangular components
- 32) Show that the impulse of a force is equal to the change in linear momentum produced in the body.
- 33) Mention any three advantages of friction.
- 34) Show that the kinetic energy of an object on reaching the ground is its gravitational potential energy.
- 35) Find the torque of a force  $(7\hat{i} + 3\hat{j} - 5\hat{k})$  about the origin. The force acts on the particle whose position vector is  $(\hat{i} - \hat{j} + \hat{k})$ .
- 36)
  - a) Define escape speed.
  - b) Mention the expression for escape speed.
  - c) What is the value of escape speed of Earth?

#### PART-D

**V Answer any THREE of the following questions:**

**3x5=15**

- 37) Derive  $V^2 = V_0^2 + 2ax$  by graphical method.
- 38) Define centripetal acceleration and obtain the expression for centripetal acceleration for a particle executing uniform circular motion.
- 39) Derive an expression for maximum speed of a car on a banked road in a circular motion.
- 40) Derive an expression for potential energy of an elastic stretched spring.
- 41)
  - a) Define angular momentum. Mention its SI unit. (2)
  - b) Show that torque is equal to the rate of change of angular momentum of a particle. (3)

**VI Answer any TWO of the following questions:**

**2x5=10**

- 42) A cricket ball is thrown at a speed of  $28 \text{ ms}^{-1}$  in a direction  $30^\circ$  above the horizontal : Calculate
  - i) The maximum height
  - ii) The time taken by the ball to return to the same level and
  - iii) The distance from the thrower to the point where the ball returns to the same level.
- 43) A driver of three-wheeler is moving with a speed of  $36 \text{ Km h}^{-1}$ . Sees a child standing in the middle of the road and brings his vehicle to rest in 4 second, just in time to save the child. What is the average retarding force on the vehicle ?  
The mass of the two-wheeler is 400 kg and the mass of the driver is 65 kg.
- 44) A pump on the ground floor of a building pumps water to fill a tank of volume  $30 \text{ m}^3$  in 15 minutes. If the tank is 40m above the ground and efficiency of the pump is 30%. How much electric power is consumed by the pump ?  
(Given :  $g = 9.8 \text{ ms}^{-2}$  and density of water  $1000 \text{ Kg m}^{-3}$ )
- 45) Calculate the acceleration due to gravity at a point
  - i) 64 km above and
  - ii) 32 km below the surface of the earth
  - iii) What is the value of acceleration due to gravity at earth is centre ?  
(Given the radius of earth = 6400 km.

Acceleration due to gravity at the surface of the Earth =  $9.8 \text{ ms}^{-2}$ )

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