

Roll No.

Total Pages : 4

1226/MH

BS-2058

DYNAMICS-VI

Semester-IV

Time Allowed : 3 Hours]

[Maximum Marks : 36

Note :- The candidates are required to attempt two questions each from Sections A and B carrying 5.5 marks each and the entire Section C consisting of 7 short answer type questions carrying 2 marks each.

SECTION-A

1. A point moving with uniform acceleration in a straight line describes successive equal distance in time t_1, t_2, t_3 show that :

$$\frac{1}{t_1} - \frac{1}{t_2} + \frac{1}{t_3} = \frac{3}{t_1 + t_2 + t_3} .$$

2. Two masses of 14 kg and 7 kg respectively are connected by a light inextensible string passing over a pulley and the system starts from rest and moves for 3 seconds, when the string breaks. Find after what further interval of time the smaller mass comes to its original position.

3. A particle starts from rest and its acceleration at any time t is $f - Kt^2$. Show that maximum velocity

u of the particle is $\frac{2}{3} \sqrt{\frac{f^3}{K}}$ and that the space

described by it before acquiring this velocity is $\frac{15u^2}{16f}$

4. A particle is performing simple harmonic motion of period T about a centre O and it passes through the position $P(OP = b)$ with velocity v in the direction OP . Prove that the time which elapses before it returns to P is

$$\frac{T}{T_1} \tan^{-1} \frac{vt}{2\pi b}.$$

SECTION-B

5. Two bodies are projected from the same point in directions making angle α_1 and α_2 with the horizontal and strike at the same point on the horizontal plane through the point of projection. If t_1 and t_2 be their times of flight, show that :

$$\frac{t_1^2 - t_2^2}{t_1^2 + t_2^2} = \frac{\sin(\alpha_1 - \alpha_2)}{\sin(\alpha_1 + \alpha_2)} .$$

6. A car weighing 200 kg is accelerating at 4 m/sec up an incline of 1 in 100, the resisting being 10 gm weight per kg. wt. Find the power exerted by the engine when the speed is 40 m/sec.
7. To a man going on a bicycle at 10 km/hr due east, the wind appears to blow from a direction 60° South-West at 6 km/hr. Find the true direction and velocity of wind.
8. Show that the work done by an impulsive force is the dot product of its impulse vector and the mean of its initial and final velocities.

SECTION-C

9. Answer all questions :
1. Define Angular momentum.
 2. Define Power.
 3. Define Potential Energy.
 4. Define Projectile.
 5. What is Relative Displacement?
 6. Define Periodic Motion.
 7. Define Conservative Field.