Code: ME2T4, AE2T4

I B.Tech - II Semester – Regular/Supplementary Examinations
April – 2019

ENGINEERING MECHANICS-II
(Common for ME & AE)

Duration: 3 hours   Max. Marks: 70

PART – A

Answer **all** the questions.   All questions carry equal marks

$$11 \times 2 = 22 \text{ M}$$

1.

a) Differentiate rectilinear and curvilinear motions.

b) State impulse-momentum principle of rectilinear translation.

c) What do you mean by D'Alembert's principle.

d) Explain normal and tangential accelerations of curvilinear translation.

e) What is meant by line of impact?

f) What is radius of gyration?

g) State parallel axis theorem of mass moment of inertia.

h) What is inertia couple?

i) Write the equation of a rigid body making pure rotation stating all the nomenclature.

j) What is meant by instantaneous centre of rotation in the context of plane motion?

k) How do you obtain dynamic equilibrium of symmetric rolling bodies?

PART – B

Answer any ***THREE*** questions.   All questions carry equal marks.

$$3 \times 16 = 48 \text{ M}$$

2. a) Two trains A and B leave the same station on parallel lines. Train A starts with uniform acceleration of 1/6 m/sec^2 and attains a speed of 24 kmph, when the throttle is reduced to keep the speed constant. Train B leaves 40 seconds after, with uniform acceleration of 1/3 m/sec^2 to attain a maximum speed of 48 kmph. When will it overtake train A?   8 M

   b) Prove that the path traced by a projectile is a parabola. 8 M

3. a) Two weights P and Q are connected by the arrangement shown in Fig.1. Neglecting the friction and the inertia of the pulleys and cord, find the acceleration 'a' of the weight Q.   Also find the tension in the cord. Assume that P = 40 kN and Q = 30 kN.   8 M
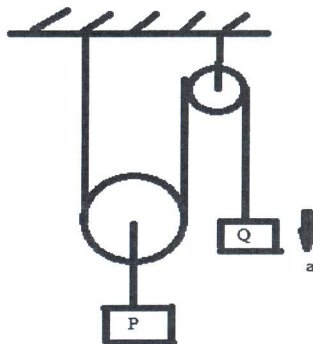

Fig.1

b) A locomotive of weight W = 600 kN goes around a curve of radius r = 300 m at a uniform speed of 70 kmph. Determine the total lateral (outward) thrust on the rails.

8 M

4. a) Find the Moment of Inertia of a slender prismatic bar about an axis perpendicular to its longitudinal axis and passing through one of its ends.   8 M

b) Determine the Moment of Inertia of a sphere about its diameter.   8 M

5. a) Derive the expressions for rotation of a rigid body under the action of a constant moment.   8 M

b) A homogeneous sphere, of radius a = 0.25 m and weight W = 1 kN, can rotate freely about a diameter. If it starts from rest and gains, with constant angular acceleration, an angular speed of N = 180 rpm in 12 revolutions, find the acting moment 'M'.   8 M

6. a) If the slender prismatic bar shown in Fig.2 is released from rest in the horizontal position AB and allowed to fall under the influence of gravity, what angular velocity 'ω' will it acquire by the time it reaches the vertical position AB_1.

8 M
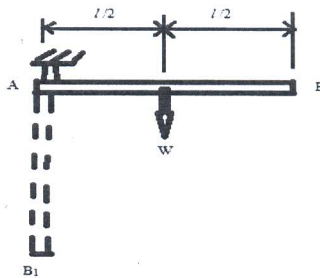
Fig.2

b) Under the action of gravity, a solid circular cylinder of weight W rolls without sliding down a plane inclined to the horizontal by the angle α. Determine the acceleration a_c of its center of gravity down the plane and the maximum angle of inclination of the inclined plane.   8 M