

Code: ME2T4, AE2T4

I B.Tech - II Semester – Regular Examinations – April 2016

ENGINEERING MECHANICS-II
(Common for ME & AE)

Duration: 3 hours

Max. Marks: 70

PART – A

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

11x 2 = 22 M

1.

- a) What do you mean by uniform motion of a rigid body?
- b) What do you mean by planar curvilinear motion?
- c) What is the difference between static equilibrium and dynamic equilibrium?
- d) State Newton's first and second laws of motion.
- e) Define work done by a force.
- f) Define the momentum of a particle in motion.
- g) When do you say that angular momentum is conserved?
- h) What is the difference between planar motion and spatial motion of a rigid body?
- i) Explain the term instantaneous centre.
- j) Determine the mass moment of inertia of a uniform Thin rod about the middle axis perpendicular to the length.
- k) What is the advantage of work-energy theorem?

PART – B

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

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

2.

a) A particle starts from rest and moves along a straight line with constant acceleration. If it acquires a velocity of 3 m/s after having travelled a distance of 7.5 m, find the magnitude of acceleration. 8 M

b) A mortar having a muzzle velocity $v_0 = 212.1$ m/s is fixed for maximum range across vertical plain.

Neglecting air resistance, calculate

(i) Time of flight of the shell.

(ii) In what proportion will the maximum range of projectile be increased if initial velocity is increased by 10%? 8 M

3.

a) A mine cage of weight 8.9 kN starts from rest and moves downwards with constant acceleration, travelling a distance $s = 30$ m in 10 seconds. Find the tensile force in the cable during this time. 8 M

b) A ball of weight W rests on a spring of constant k , it produces a static deflection of 25 mm. How much will the same ball compress the spring if it is dropped from a height of 0.3 m. Neglect the mass of spring. 8 M

4. Derive the expression for mass moment of inertia of the following material bodies.
- a) Circular ring 8 M
 - b) Solid sphere 8 M
5. The angle of rotation of a rigid body is given as a function of time by the equation $\theta = \theta_0 + bt + ct^2$. Find general expressions for angular velocity and angular acceleration of the body. Determine also values of the constants b and c if the initial angular velocity is 2π rad/s and one second later it is 6π rad/s. 16 M
6. Derive the expression for D'Alembert's principle in relative motion. 16 M