

B.E. (Mechanical Engineering)-1st Semester
MEC-101: Engineering Mechanics

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Unit.

x-x-x

I. Answer the following briefly:-

- a) State the conditions for equilibrium of a particle.
- b) Define centroid and centre of gravity.
- c) What is a zero-force member in a truss?
- d) Differentiate between static and kinetic friction.
- e) Write the principle of work and energy.
- f) Define impulse and momentum.
- g) What is the difference between absolute and relative motion analysis?
- h) State the principle of moments.
- i) Define conservative forces with one example.
- j) What is the difference between mass moment of inertia and area moment of inertia?
(10x1)

UNIT - I

- II. A particle is subjected to three coplanar forces: 40 N at 0°, 30 N at 120°, and 20 N at 240°. Using vector addition, determine the resultant force and check equilibrium. Draw the free-body diagram. (10)
- III. A uniform beam of length 6 m and weight 600 N is supported at its ends. A point load of 400 N is applied at 2 m from the left end. Find reactions at supports. Also, determine the centroid and draw shear force and bending moment diagrams. (10)
- IV. What do you mean by truss analysis? Explain the truss analysis using the method of joints by taking an example. (10)

UNIT - II

- V. A particle moves along a straight line with acceleration $a=2t$ m/s². If the initial velocity is zero, determine the displacement and velocity after 5 seconds. (10)
- VI. A 10 kg block slides down a rough inclined plane (30°) with a coefficient of friction of 0.2.
 - a) Find acceleration using Newton's second law.
 - b) Calculate velocity after 4 seconds. (10)
- VII. A rigid body rotates about a fixed axis with angular acceleration 4 rad/s². If the initial angular velocity is 2 rad/s, calculate the angular displacement and angular velocity after 5 seconds. Also, compute kinetic energy if moment of inertia is 10 kg·m². (10).

x-x-x