



B.Tech I Semester Regular Examinations, March/April 2023
Engineering Mechanics
(Civil Engineering)

Maximum Marks: 60

Date:06.04.2023 Duration: 3 hours

- Note: 1. This question paper contains two parts A and B.
2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks

(10x1M=10 Marks)

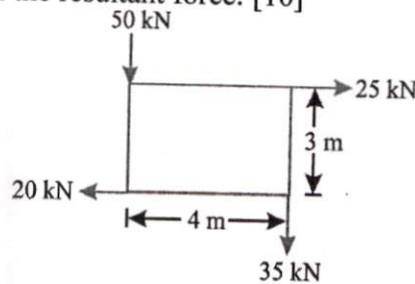
1. a State Lami's theorem.
- b Define Moment of a force.
- c State the laws of dry friction.
- d Define center of gravity.
- e Define polar moment of inertia.
- f State the Parallel axis theorem.
- g Write the transfer formula for mass bodies.
- h Compare Kinetics and Kinematics.
- i A particle moving with SHM has an acceleration of 4.8 m/s^2 at a distance of 0.8 m from the centre of oscillation. Find the time period of oscillation.
- j What is virtual work?

Part-B

Answer All the following questions.

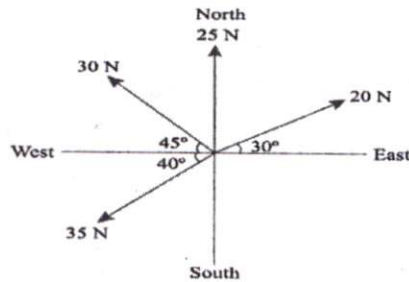
(5X10M=50Marks)

- 2 Systems of forces are acting at the corners of a rectangular block as shown in Fig. Determine the magnitude and direction of the resultant force. [10]



OR

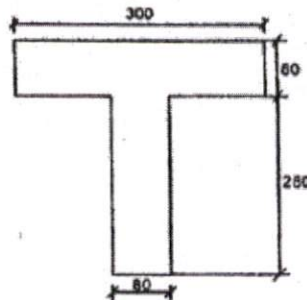
- 3 The following forces act at a point: (i) 20 N inclined at 30° towards North of East, (ii) 25 N towards North, (iii) 30 N towards North West, and (iv) 35 N inclined at 40° towards South of West. Find the magnitude and direction of the resultant force. [10]



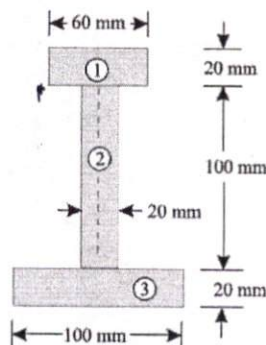
- 4 A ladder 5 m long rests on a horizontal ground and leans against a smooth vertical wall at an angle of 70° with the horizontal. The weight of the ladder is 300 N. The ladder is on the verge of sliding when a man weighing 750 N stands on a rung 1.5 m along the ladder. Calculate the coefficient of friction between the ladder and the floor. [10]

OR

- 5 Find the centroid of T-section shown in figure. All dimensions are in mm. [10]



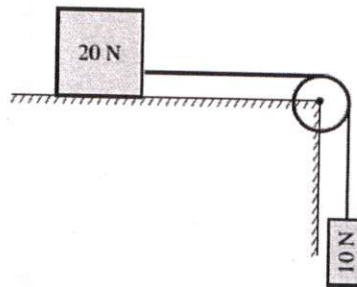
- 6 The given I-section is made up of three rectangles as shown in figure. Find the moment of inertia of the section about the horizontal axis passing through the center of gravity of section. [10]



OR

- 7 Derive the expression for mass moment of inertia for a uniform hollow sphere of mass 'M' and radius 'R'. [10]

- 8 Two bodies of weight 20 N and 10 N are connected to the two ends of a light inextensible string, passing over a smooth pulley. The weight of 20 N is placed on the horizontal surface while the weight of 10 N is hanging freely in air as shown in figure. The horizontal surface is a rough one, having the value of coefficient of friction as 0.3. Find the acceleration of system and tension in the string. [10]



OR

- 9 An elevator cage of mass 900 kg when empty is lifted or lowered vertically by means of a wire rope. A man of mass 72.5 kg is standing in it. Find: [10]
(a) The tension in the rope,
(b) The reaction of the cage on the man, and
(c) The force exerted by the man on the cage, when the cage is moving up with an acceleration of 3 m/s^2 .
- 10 The time period of a simple harmonic motion is 6 seconds, and the particle oscillates through a distance of 300 mm on each side of the mean position. Find the maximum velocity and maximum acceleration of the particle. [10]
- OR
- 11 Explain briefly the principle and concept of virtual work with neat sketch. Mention different applications of virtual work. [10]

