G 595

(Pages : 4)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2014

First and Second Semesters

EN 010 104—ENGINEERING MECHANICS

(New Scheme—2010 Admission onwards)

(Regular/Improvement/Supplementary)

[Common for all Branches]

Time : Three Hours

Maximum : 100 Marks

Part A

Answer **all** *questions briefly.*
Each question carries 3 *marks.*

1. Differentiate scalar and vector quantities with example.
2. What is virtual work ? Give *one* application.
3. What are the assumptions made in the analysis of trussess ?
4. Define (a) velocity ; (b) relation velocity ; and (c) acceleration.
5. Explain linear momentum.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Explain the process of translation of force to a parallel position with neat sketch.
7. Derive the expressions of centroid of the area under the following curves :

   (a) $y = kx^2$ and ; (b) $x = ky^2$.

8. Discuss the method of sections in the analysis of plane trusses.
9. Explain clearly, how would you find out the time for exchange of signals of the two bodies moving along inclined directions ?
10. A solid sphere of mass m and radius r rolls down a plane inclined at an angle θ with the horizontal. Find the acceleration of the sphere.

(5 × 5 = 25 marks)

Turn over

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. ABCD is a square, each side being 20 cm and E is the middle point of AB. Forces of 7, 8, 12, 5, 9 and 6 kgf act on a body in the lines of directions AB, EC, BC, CA and DE respectively. Find the magnitude, direction and position of the resultant force.

Or

12. ABCD is a rectangle in which AB = CD = 100 mm and BC = DA = 80 mm. Forces of 100 N each act along AB and CD and forces of 50 N each act along BC and DA. Find the resultant moment of the two couples.

13. The diameter of the pulleys in a differential pulley block are 300 mm and 250 mm respectively. Using the principle of virtual work and neglecting friction, find the value of the effort required to lift a load of 3 tonnes.

Or

14. Find the centre of Gravity of the Z-section shown in Fig 1.

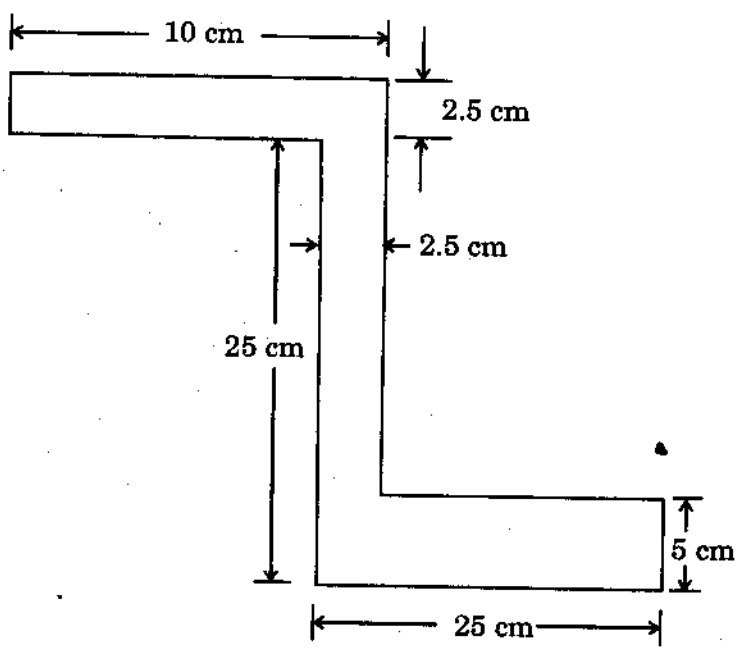

Fig. 1.

15. Determine the horizontal force P to be applied to the wedge so as to raise the weight W of 2 KN. Assume the wedge to be of negligible weight and the contact surfaces between weight W and vertical wall are smooth. The coefficient of friction between the weight W and wedge is 0.25 and that between wedge and lower block is also 0.25. Is the system self-locking one ?

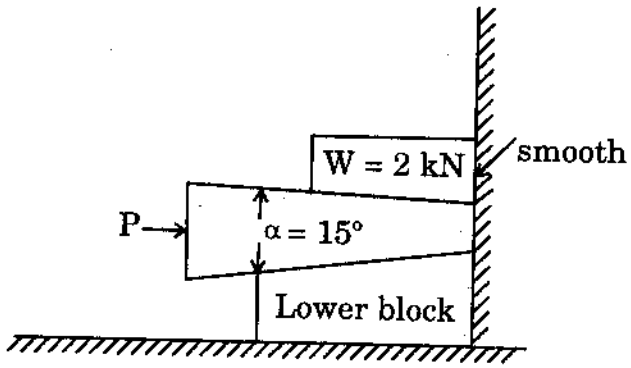

Fig. 2.

Or

16. A hexagonal truss ABCDEF centre at G formed of 11 bars of 2 m length each. It is hinged at one end and roller supported at the other end. Find the axial forces in the members CD and GB.

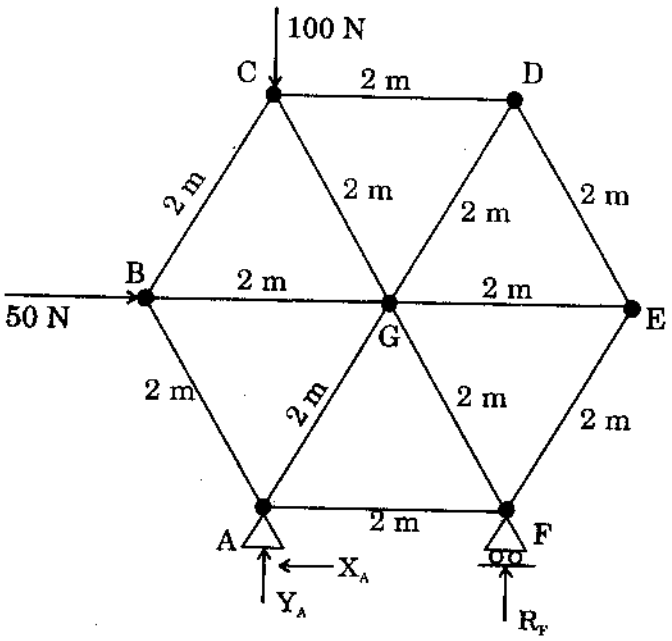

Fig. 3.

17. A lift moves up with a constant acceleration upto a height of 900 m and 300 m with constant retardation and then comes to rest. Determine (a) Acceleration ; (b) Retardation ; and (c) the maximum velocity of the lift if the total time of travel is 30 seconds and the accelaration is one-third of the retardation.

Or

18. A particle moves with simple harmonic motion. When the particle is 0.75 m from the mid-path, its velocity is 11 m/s and when 2 m from the mid-path its velocity is 3 m/s. Find the angular velocity, periodic time and its maximum acceleration.

19. A sphere of mass 1 kg, moving at 3 m/sec, overtakes another sphere of mass 5 kg moving in the same line at 60 cm/sec. Find the loss of kinetic energy during impact, and show that the direction of motion of the first sphere is reversed. Take coefficient of restitution $e = 0.75$.

Or

20. A car of mass 1500 kg is uniformly accelerated. Its speed increases from 50 km/hr to 75 km/hr after traveling a distance of 200 m. The resistance to the motion of the car is 0.2 % of the weight of the car. Determine (a) the maximum power required ; (b) the power required to maintain a constant speed of 75 km/hr.

(5 × 12 = 60 marks)