C 5772

(Pages : 4)

Name.....

Reg. No.....

COMBINED FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2005

EN2K—107A ENGINEERING MECHANICS (A)

Common to AI, CH, CE, CS, EE, EC, IT, IC AND AR

Time : Three Hours

Maximum : 100 Marks

Answer all questions.
Assume any missing data, suitably.

Part A

I. (a) Explain coplanar concurrent forces and coplanar parallel forces.

(b) Two blocks A and B rest on a rough inclined plane of inclination 14° with the horizontal as shown in fig.1. The coefficients of friction between the inclined plane and A and B are 0.2 and 0.3 respectively. If B weighs 50 N, find the weight of A for which slipping will impend.

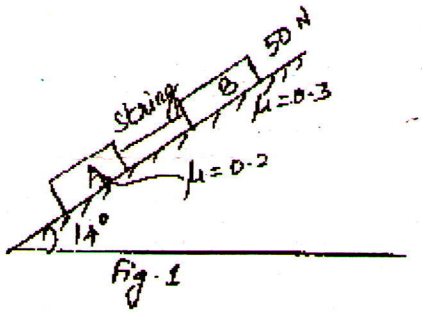

Fig. 1

(c) Explain the principles involved in the method of joints and the method of sections in the analysis of trusses.

(d) A high tension line weighs 9 n/m and can safely withstand a maximum tension of 5 kN. The lowest points of the line is required to be atleast 10 m above the ground. The towers supporting the line are 15 m high. Calculate the maximum spacing of the towers.

(e) How will you determine the centroid of area having :

(i) two axis of symmetry.

(ii) one axis of symmetry.

(iii) no axis of symmetry.

(f) Define machine, simple machine and efficiency. Derive the expression for the maximum efficiency of a machine.

Turn over

(g) Derive expressions for the final velocity and the distance travelled of a particle moving under uniformly accelarated motion.

(h) Prove that the trajectory of a projectile is parabola.

(8 × 5 = 40 marks)

2. (a) (i) An oil drum 50 cm diameter and weight 100 N when rolled along the horizontal comes across a stepped footing 10 cm high as shown in fig.(2). Find the minimum pull required at the top of the drum to overcome the obstacle.

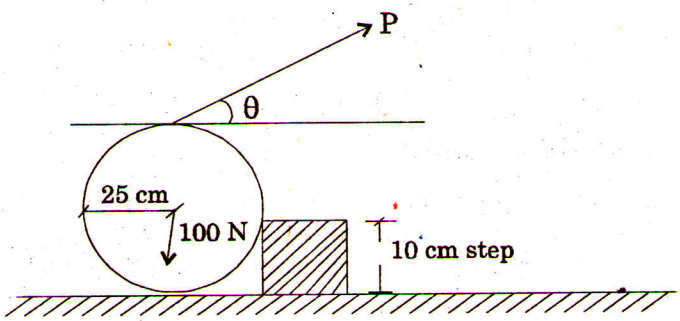

Fig. 2

(7 marks)

(ii) Find the supports reactions for the simply supported beam shown in fig. 3.

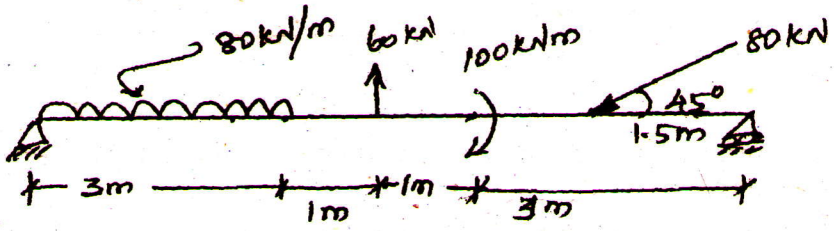

Fig. 3

(8 marks)

Or

(b) A ladder 3 m long and weighing 150 N is placed against a wall with end B at floor level and end A in wall, with AB making 60° with the floor. Coefficient of friction at wall 0.25 and at floor is 0.3. In addition to self weight the ladder supports a man weighing 800 N at A. To prevent slipping, a horizontal force P is applied at B. Find the minimum value of P for this condition.

(15 marks)

3. (a) Analyse the truss shown in fig. 4 using method of joints.

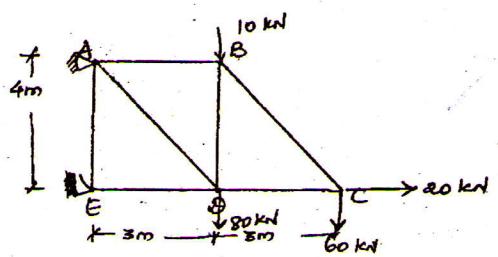

Fig. 4

(15 marks)

Or

(b) A suspension cable of 80 m span is having supports at different levels. The left support is lower than the right by 4 m. The lowest point of the cable is at a distance of 2 m below the left support. The cable is subjected to a uniformly distributed load of 50 kN/m over its horizontal span. Find (a) the reactions at the supports (b) the minimum and maximum tension (c) the length of the loaded cable.

(15 marks)

4. (a) A lifting machine can lift a load of 1000 N with an effort of 40 N. With an effort of 55 N it can lift a load of 1500 N. Find the law of the machine. If the velocity ratio of the machine is 45. Find the maximum mechanical advantage and the maximum efficiency of the machine.

(15 marks)

Or

(b) Calculate the moment of Inertia of the cross section shown in fig. 5 about the centroidal horizontal and vertical axes.

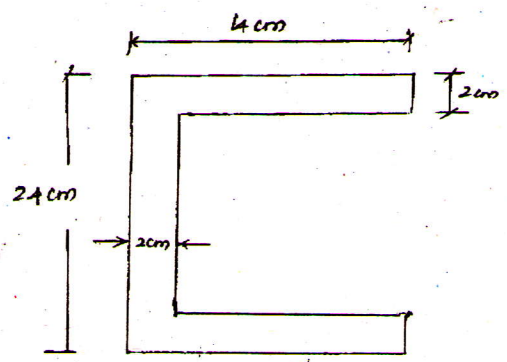

Fig. 5

(15 marks)

Turn over

5. (a) (i) A car enters a curve of 200 m radius at a speed of 45 kmph. If the car increases its speed at a rate of $2m/s^2$, what will be its total acceleration when the car has travelled 450 m along the curve.

(10 marks)

(ii) A bullet weighing 1 N is moving with a velocity of 300 m/s and hits a wooden block of 60 N moving away at 20 m/s and gets embedded in it. Find the velocity of the bullet after the impact and the amount of kinetic energy lost.

(5 marks)

Or

(b) Two ships A and B leave the port at the same time. The ship A is travelling North-West at 32 kmph and ship B, 40° south of west at 24 kmph. Find (a) the velocity of the ship B relative to ship A (b) At what time they will be 150 km apart.

(15 marks)