(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 154203   **Roll No.**

B.Tech.

(SEM. II) THEORY EXAMINATION 2013-14

ENGINEERING MECHANICS

Time : 3 Hours   *Total Marks : 100*

Note :– Attempt all questions.

SECTION–A

1. Attempt all parts of this question. Each part carries 2 marks.

    (2×10=20)

    (a) Explain principle of transmissibility of force briefly.

    (b) Explain briefly the concept of free body diagram with the help of suitable example.

    (c) Define beam and classify different types of beams.

    (d) What is a "Truss" ? How the trusses are classified ?

    (e). Explain Lami's theorem.

    (f) Explain and verify Varignon's theorem

    (g) Explain Parallel Axis Theorem.

    (h) Explain Perpendicular Axis Theorem

    (i) Explain rectilinear and curvilinear motion

    (j) State D'Alembert principle.

SECTION-B

2. Attempt any **three** parts of this question. Each part carries 10 marks.   (10×3=30)

(a) Determine the magnitude of force F and direction θ so that the resultant of the three forces as shown in fig. 1, is vertically downward with a magnitude of 6 KN.
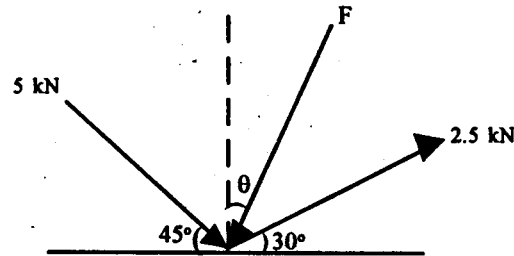

Fig. 1

(b) A ladder of length L rests against a wall, the angle of inclination being 45°. If the coefficient of friction between the ladder and the ground and that between the ladder and the wall be 0.5 each. What will be the maximum distance along ladder to which a man whose weight is 1.5 times the weight of the ladder may ascend before the ladder begins to slip ?

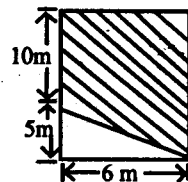(c) Locate the centroid of the shaded area as shown in fig 2.

Fig. 2

(d) A particle is dropped from the top of a tower 100m high. After one second another particle is projected upwards from the foot of the tower which meets the first particle at a height of 18m. Find the velocity with which the second particle was projected.

(e) Find the tension in the string and acceleration of blocks A and B weighing 200 N and 50 N respectively, connected by a string and frictionless and weightless pulleys as shown in fig-3.
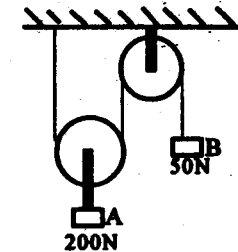

Fig. 3

SECTION-C

Note :– Attempt all question of this section. Each question carries 10 marks.   (10×5=50)

3. Attempt any **one** part of the following :

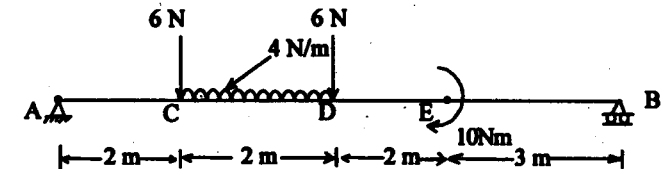(a) Determine the reactions at A and B fig 4

Fig. 4

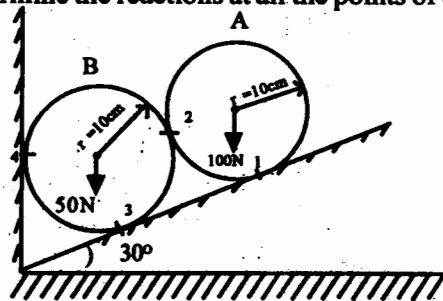(b) Determine the reactions at all the points of contact (fig.5).

Fig. (5)

4. Attempt any **one** part of the following :

(a) Find the force P required to move the lower block A and tension in the cable C. Take coefficient of friction for all contact surfaces to be 0.3 (fig 6).
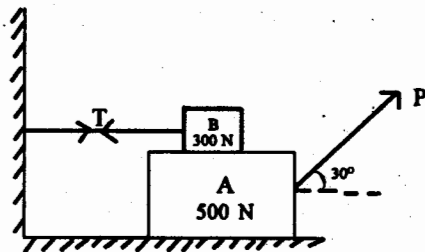

Fig. 6

(b) Determine the magnitude and nature of forces in all members of the truss shown in fig 7.
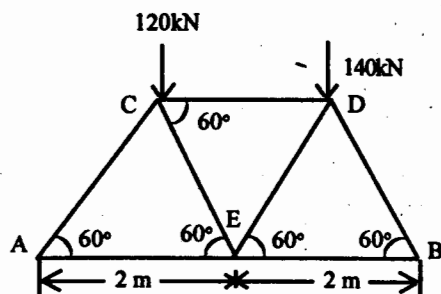

Fig. 7

5. Attempt any **one** part of the following :

(a) Find the moment of Inertia of the T section shown in fig-8 about its centrodial x-axis and centroid y-axis.
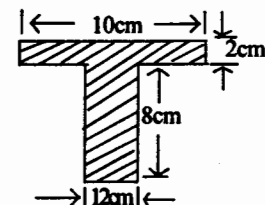

Fig. 8

(b) Derive the expression for the Mass Moment of Inertia of a Rectangular Plate of thickness 't'.

6. Attempt any **one** part of the following :

(a) A tourist is driving his car at 90 km/hr. He observes red light 200 m ahead turn red. The traffic light is timed to remain red for 15 sec. If the motorist wishes to pass the light without stopping. Find the required minimum deceleration. Also find the speed of the motor as it passes the light.

(b) A machine raised a load of 400 N through a distance of 200 m. The Effort, a force of 60 N moves 1.8 m during the process. Calculate Mechanical Advantage, velocity ratio, effeciency at this load.

7. Attempt any **one** part of the following :

(a) Two blocks weighing 200 N and 300 N are hung to the ends of a rope passing over an ideal pulley as shown in fig-9. How much distance the blocks will move in increasing the velocity of system from 2m/s to 4 m/s ? How much is the tension in the string ?
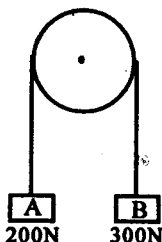

Fig. 9

(b) Find the acceleration of bodies and tension in the string joining A and B shown in fig.10.

Fig. 10