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SE-6019

First Year B. E. (Sem. I & II) (All Branches) Examination

April / May – 2011

Engineering Mechanics

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **First Year B. E. (Sem. 1 & 2) (All Branches)**

Name of the Subject :

☛ **Engineering Mechanics**

☛Subject Code No. : **6 0 1 9** ☛Section No. (1, 2,.....) : **Nil**

Seat No. :

Student's Signature

(2) Answer must be written in same answer book.
(3) Figures to the right indicate full marks.
(4) Use of non-programmable calculator is permitted.
(5) Assume suitable data, if required and also mention it clearly.

1 (a) Answer the following : (explain with sketch) 8
(i) Explain space diagram, vector diagram and free body diagram.
(ii) Explain co-planner, concurrent and co-linear forces.
(iii) Reactions at roller and hinge in truss.
(iv) Wedges and their applications.

(b) Determine megnitude and direction of the resultant of five forces acting on a body as shown in **Fig. 1**. 8

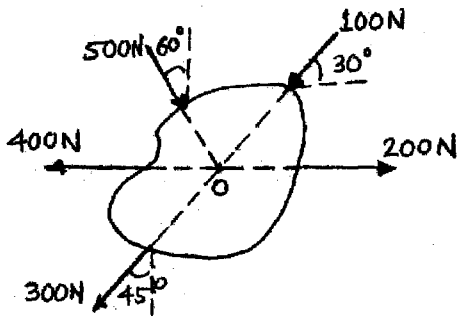

Fig. 1

OR

(b) Replace the force-couple system shown in **Fig. 2** by a single force and moment at A. 8

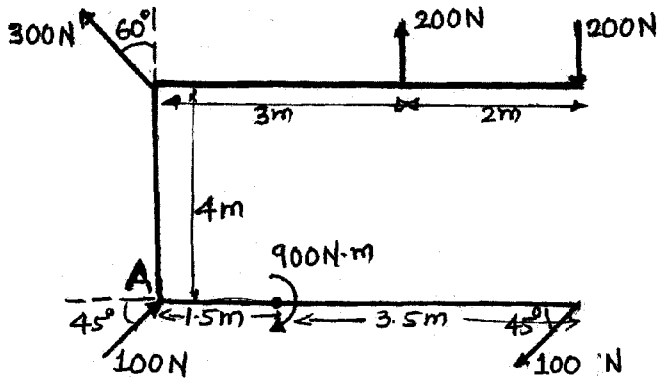

Fig. 2

2 (a) Determine reactions at hinge and roller support of a beam shown in **Fig. 3**. **6**

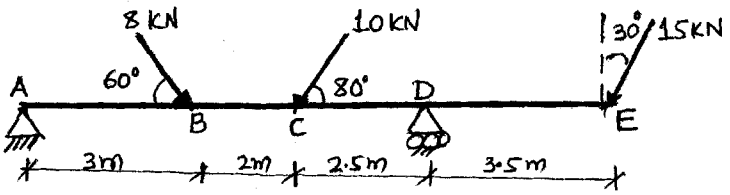

Fig. 3

(b) With the help of sketch show the external and internal forces on truss member subjected to tensile and compressive force. **2**

(c) A block weighing 2000 N is to be lifted up by applying a horizontal force P to the wedge. Determine the minimum horizontal force to be applied to raise the block **Fig. 4** $\mu_s = 0.25$ at all surfaces in contact. **8**

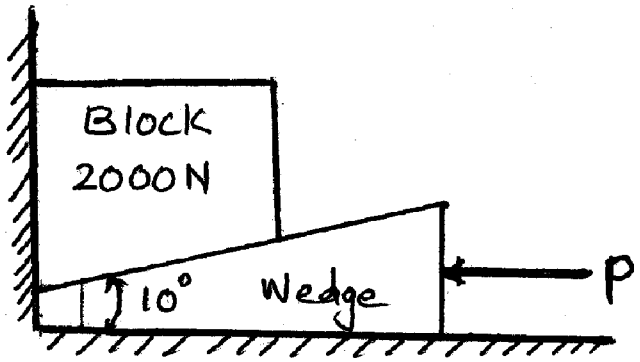

Fig. 4

OR

(c) Determine tensions in the cable and distance Y_B due to loads shown in **Fig. 5**. 8

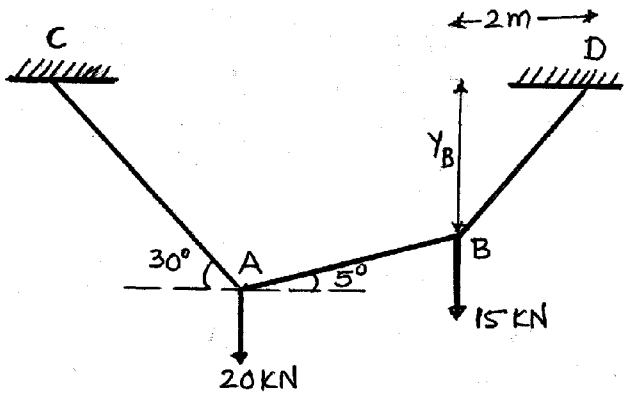

Fig. 5

3 A plane truss is shown in **Fig. 6**. Determine :

(a) Determinancy and stability of the truss. **3**

(b) Reactions. **4**

(c) Forces in all members by method of joints. **9**

(d) Forces in AD and AB by section methods. **2**

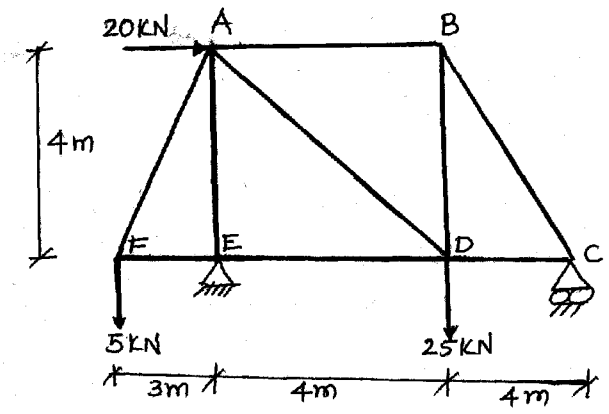

Fig. 6

4 (a) Fill in the blanks : **5**

(i) The product of mass and velocity is called _____ of the body.

(ii) Radius of gyration of an area. A is given by ____.

(iii) The unit of moment of inertia is _____.

(iv) _____ may be defined as the capacity of doing work.

(v) The path travelled by a particle in air is _____.

(b) Answer the following : (any **two**) **5**

(i) Explain D'Alembert's principal.

(ii) State Pappus-Guldinus theorem for surface of revolution to obtain. Surface area.

(iii) State and explain perpendicular axis theorem.

5 (a) Determine moment of inertia of a section shown in **fig. 7** about horizontal and vertical centroidal axis. **8**

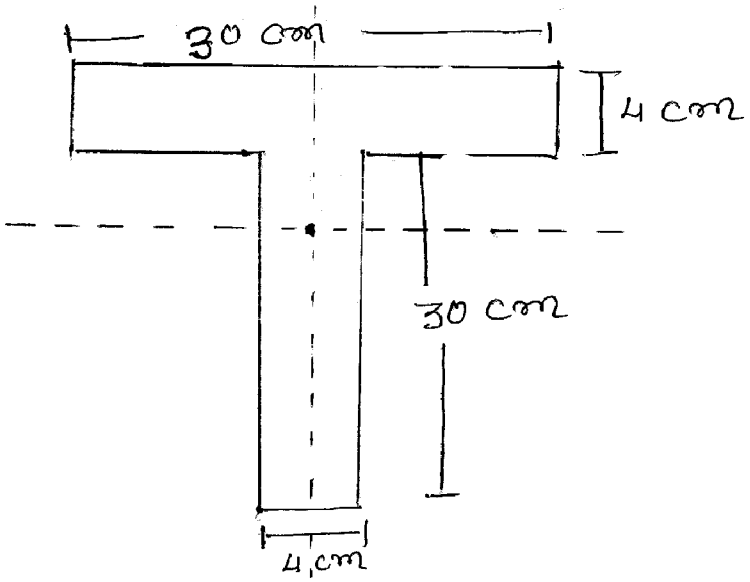

Fig. 7

OR

(a) Locate the centroid of the shaded lamina as shown in **fig.** 8. 8

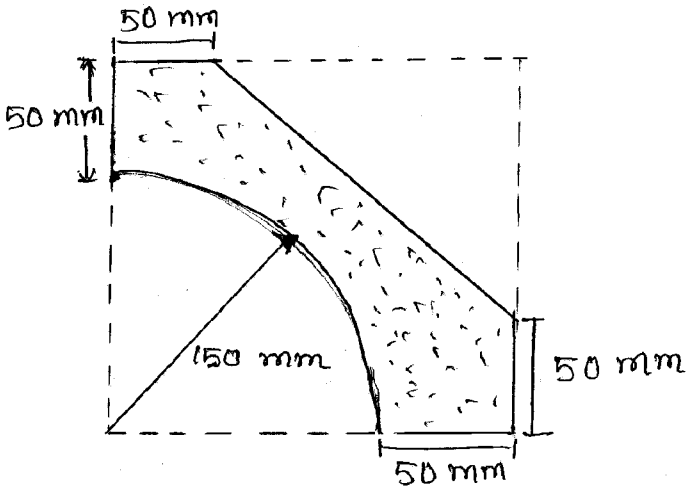

Fig. 8

(b) A bar is bent into shape as shown in **Fig. 9**. Find co-ordinates of centroid. 8

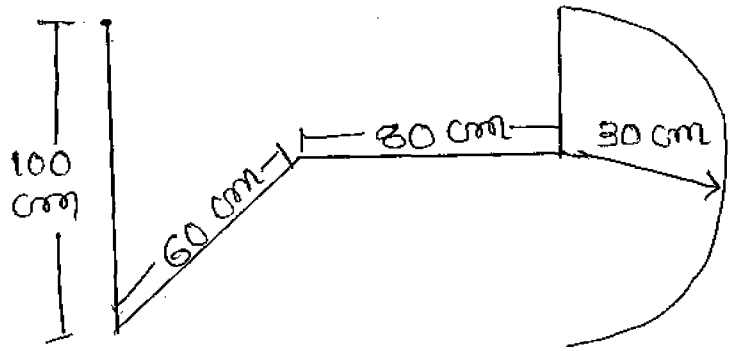

Fig. 9

6 (a) Attempt any two : **16**

(1) A bomb is released from an acroplane flying at a speed of 1500 km/hr. On a straight level course 2500 m above the ground. Find the time required for the bomb to reach the ground and the horizontal distance travelled by the bomb after its release. Assume g=9.8 m/s^2 and ground to be horizontal neglect air resistance.

(2) A train is travelling with a speed of 80 km/hr. A passenger in the train throws a stone with a speed of 60 km/hr making an angle 90^o with the direction of motion of a train. Find the resultant velocity of the stone and its direction of motion with respect to train direction when α=60.

(Angle between direction of stone and train).

(3) An object falls from rest from an unknown height. In the last second of its motion, the object is travels a distance of 70m. If g=9.8 m/s^2.

Determine :

(a) the ht. from which the object falls.

(b) Total time taken by the object in falling.

(b) Attempt the following : 8

If a velocity of block 'A' shown in **fig. 10**, moving up increasing at the rate of 1 m/s each second. Determine the acceleration of block 'B'.

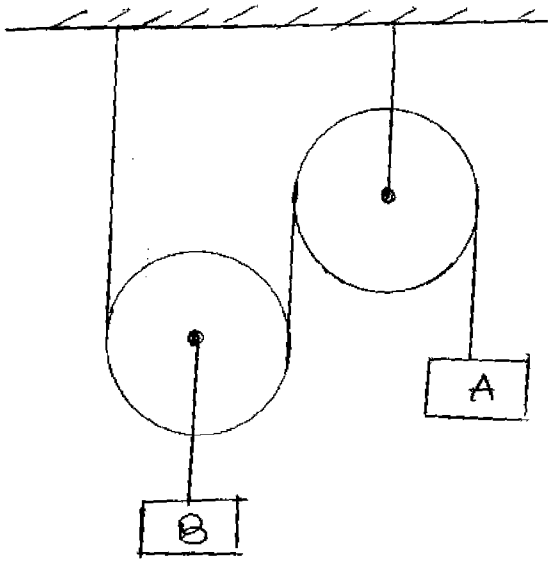

Fig. 10