B.Arch. Part-I 1st Semester Examination, 2009-10

Engineering Mechanics

(AM-101A)

Time : 3 hours **Full Marks : 70**

Use separate answerscript for each half.
Answer SIX questions, taking THREE from each half.
Assume any data reasonably, if required.

FIRST HALF

1. By using the method of sections, find the magnitude and nature of forces produced in bars marked 1, 2 and 3 of the truss shown in Fig.1 below due to action of ball of weight W = 5 kN resting at the hinge D and supported by a cable EF. The cable EF is parallel to AC.

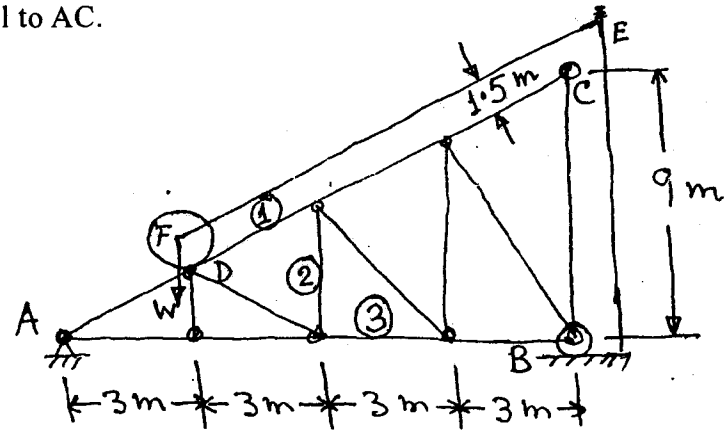

Fig.1

2. A ladder consisting of two equal parts AB and AC hinged together at A and connected by a horizontal string DE rests on a smooth horizontal plane by the applied load P. The following numerical data are given :-
l = 3 m, a = 2.1 m, h = 1.5 m. Find tension in the string DE.

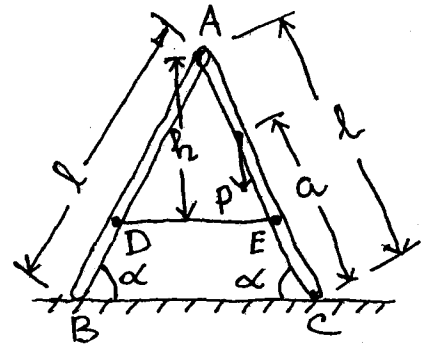

Fig.2

3. A mast AB supported by spherical socket at A and horizontal wires BC and BD carries a vertical load P at B as shown in Fig.3 below. Find the axial force induced in each of the three members of this system.

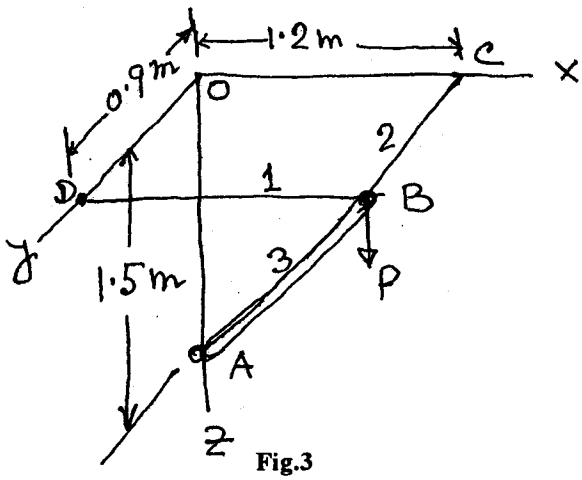

Fig.3

4. Two blocks A and B under the action of gravity slide down the inclined plane CD that makes with the horizontal plane an angle, $\alpha = 30°$. If the weights of the blocks are $W_A = 44.5\,N$ and $W_B = 89\,N$ and coefficients of friction between them and the inclined plane are $\mu_A = 0.15$ and $\mu_B = 0.30$, find the pressure existing between the blocks during the motion.

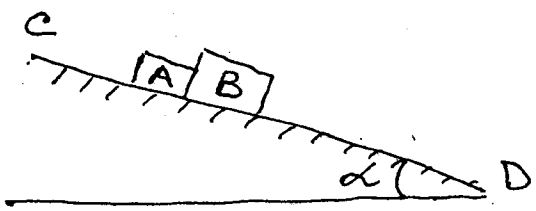

Fig.4

5. Two balls of weight $W_A = 44.5\,N$ and $W_B = 66.75\,N$ are connected by an elastic string and supported on a turntable as shown in Fig.5 below. When the turntable is at rest, the tension in the string is $S = 222.5\,N$ and the balls exert this same force on each of the stops A and B. What forces will they exert on the stops when the turntable is rotating uniformly about the vertical axis CD at 60 r.p.m.?

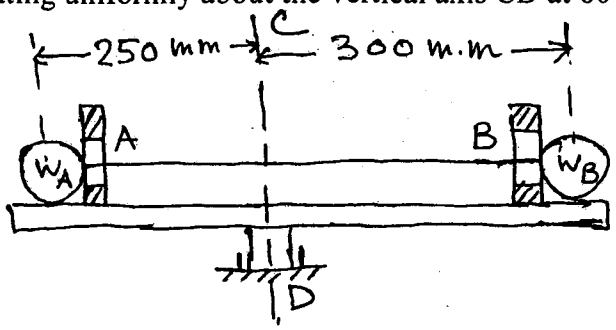

Fig.5

SECOND HALF

6. Two equal loads P are supported by a flexible string ACDB, as shown in Fig.6. Determine string tension in the portions AC and CD. Assume $l = 30$ m and $h = 5$ m. Neglect the weight of the string.

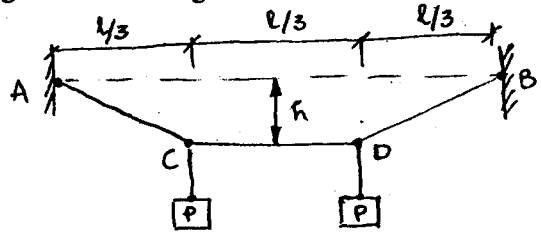

Fig.6

7. Two beams AB and DE are loaded and supported as shown in Fig.7. Find the magnitude of the reaction R_E at E due to force P = 200 N applied at B.

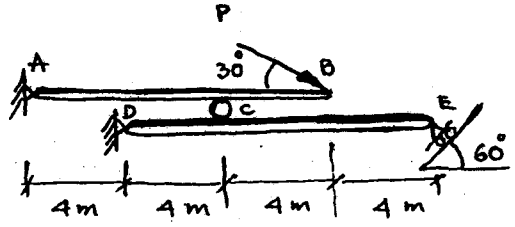

Fig.7

8. Two blocks of weights W_1 and W_2 rest on a rough inclined plane and are connected by a short piece of string as shown in Fig.8. If the coefficients of friction are $\mu_1 = 0.2$ and $\mu_2 = 0.3$, respectively, find the angle of inclination of the plane for which sliding will impend. Assume $W_1 = W_2 = 5$N.

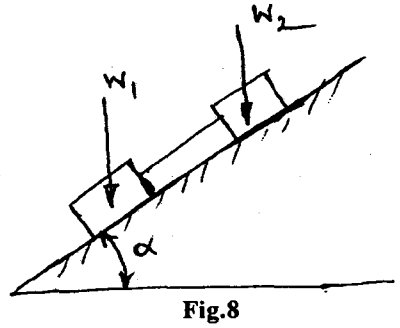

Fig.8

9. Determine, by integration, the coordinates x_C, y_C of the centroid C of the quadrant AB of a circle of radius r (refer to Fig.9).

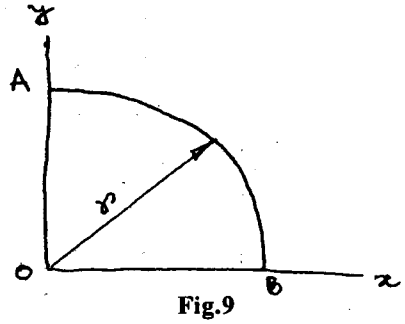

Fig.9

10. A prismatic bar AB of weight Q and length l is supported by a small roller at C and presses against a smooth vertical wall at A (Fig.10). If an additional load P is applied at the end B of the bar, find the position of equilibrium of the bar as defined by the angle α that its axis makes with the horizontal.

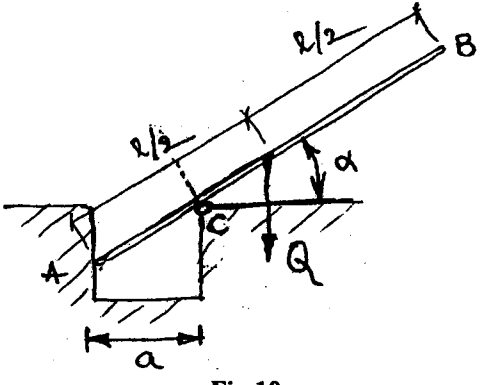

Fig.10