B.E. All Branches Second Semester (C.B.S.) / B.E. (Fire Engineering) Second Semester

Engineering Mechanics

P. Pages : 3 **NRT/KS/19/3290/3942**

Time : Two Hours * 0 5 7 6 * Max. Marks : 40

Notes : 1. Solve Question 1 OR Questions No. 2.
2. Solve Question 3 OR Questions No. 4.
3. Solve Question 5 OR Questions No. 6.
4. Solve Question 7 OR Questions No. 8.
5. Due credit will be given to neatness and adequate dimensions.
6. Assume suitable data whenever necessary.
7. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) State and explain Varignon's Theorem. **3**

b) Calculate the resultant of the force and its X and Y intercept shown in fig. 1. **7**

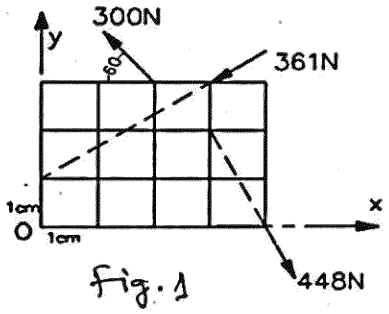

Fig. 1

OR

2. a) A force 280N in magnitude passes through point A (-2, 1, 3) towards B (4, 4, 5). Co-ordinates of point C and D are (-2, 0, 1) and (2, 0, -2) respectively. Find, **6**
a) Component of force F along AC, b) Moment of F about a point C,
c) Moment of F about a line BC.

b) What do you understand by equilibrium? Write equations for 3-D force system. **4**

3. a) Discuss various types of force systems with neat sketches. **4**

b) The weight of 200N hangs to chord and it is pass over a friction less pulleys as shown in figure. Find the force P and angle θ to keep the wheel in equilibrium. Weight of wheel is 300N. (Fig 2). **6**

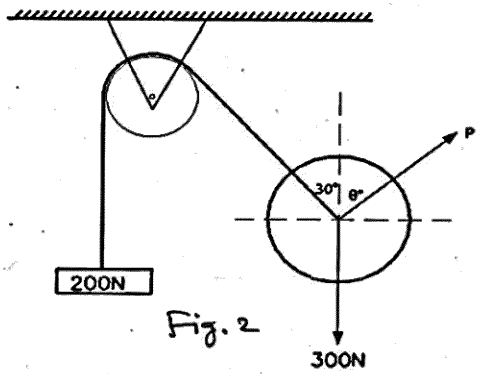

Fig. 2

OR

4. a) Find the forces in all members of the truss as shown in fig. 3. **5**

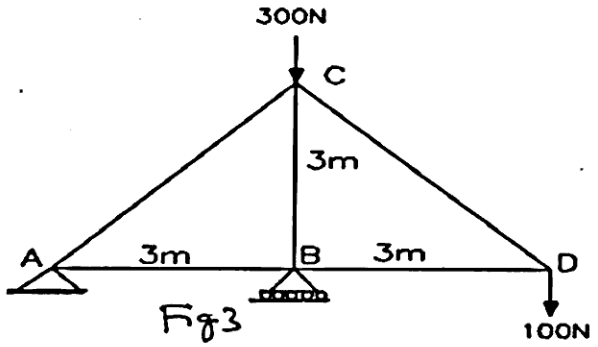

Fig3

b) Find support reactions at A and B as shown in Fig. 4. **5**

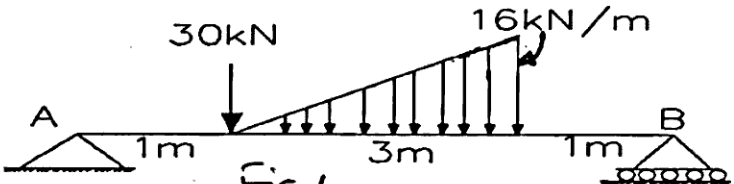

Fig.4

5. For the figures, shown below:

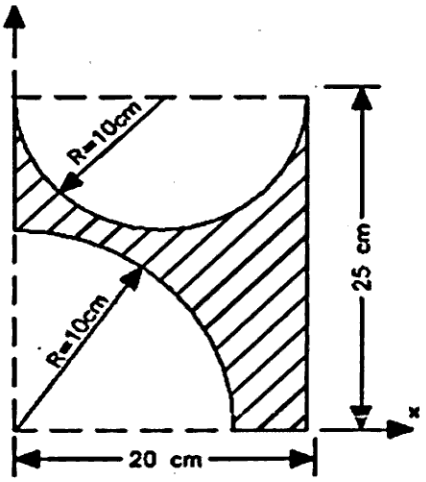

Fig. 5

i) Locate the centroid of shaded portion of the area. **5**

ii) Moment of inertia with respect to indicated x and y axis. **5**

OR

6. a) State and explain principle of virtual work. **3**

b) Find the support reaction at A, D and E using principles of virtual work. Fig. 6. **7**

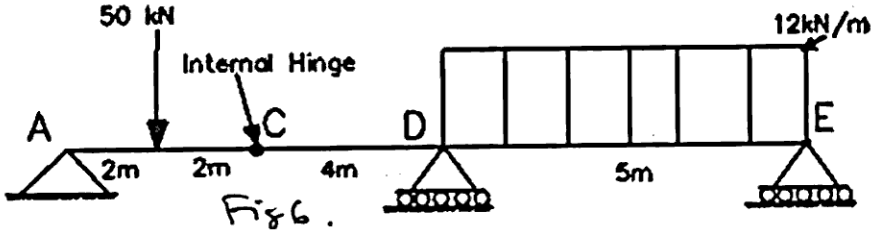

Fig 6.

7. a) Explain **3**
   i) Coefficient of Restitution.
   ii) Law of conservation of momentum.

   b) Determine the acceleration of each body in the system as shown in figure. Assuming the pulley to be friction less and of negligible weight. $r_1 = 0.6$m and $r_2 = 0.3$m. Fig. 7. **7**

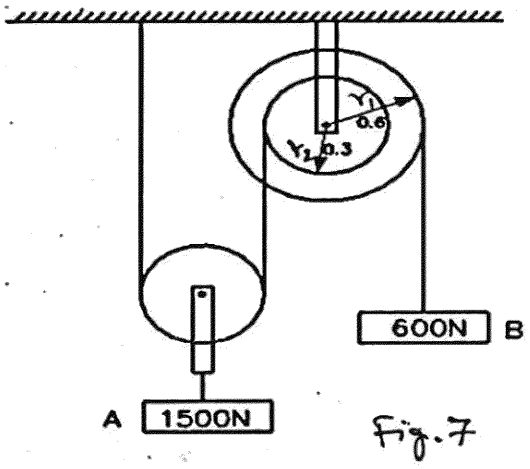

Fig. 7

OR

8. A spherical wall A of mass 1 kg when released from rest slides down the surface of a smooth bowl and strikes another spherical ball B of mass 0.25kg resting at the bottom of the bowl. **10**

Determine the height h from which ball A should be released so that after the impact ball B "JUST LEAVES THE BOWL". The coefficient of restitution may be assumed to be 0.8. Refer fig. 8.

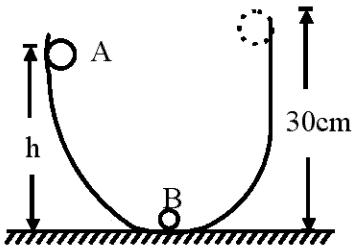

Fig. 8

****