

B.E. Second Semester (Fire Engineering) (C.B.S.)  
**Engineering Mechanics Paper - IV**

P. Pages : 4

Time : Two Hours

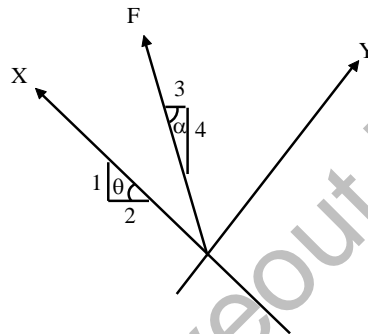


TKN/KS/16/7293

Max. Marks : 40

- Notes :
1. All questions carry marks as indicated
  2. Solve Question 1 OR Questions No. 2.
  3. Solve Question 3 OR Questions No. 4.
  4. Solve Question 5 OR Questions No. 6.
  5. Solve Question 7 OR Questions No. 8.
  6. Assume suitable data wherever necessary.
  7. Illustrate your answers wherever necessary with the help of neat sketches.
  8. Use of non-programmable calculator is permitted.

1. a) In figure the x-component of F is 893N, find its Y-component. 4



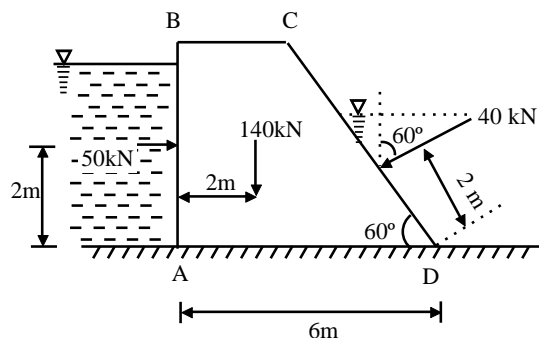
- b) A force F, 70 N in magnitude passes through point A (-2, 1, 3) towards B (4,4,5) 6  
 coordinates of point C and D are (-2, 0, 1) and (2, 0, -2) respectively.

Find

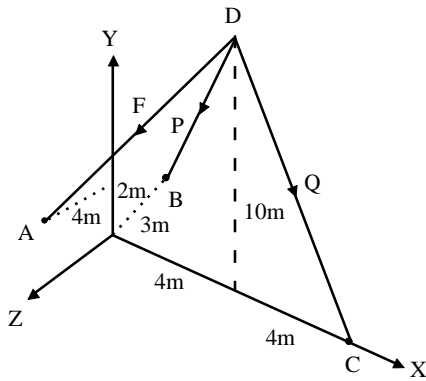
- i) Component of F along AC
- ii) Moment of F about line BC
- iii) Moment of F about line CD.

OR

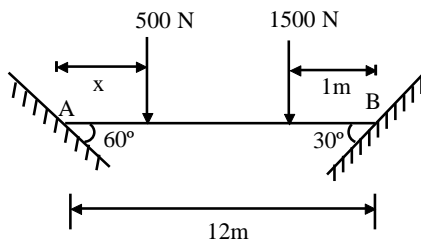
2. a) A dam is subjected to 3 forces, 50kN force on the upstream vertical face AB, 40kN force 5  
 on the downstream inclined face and its own weight of 140kN as shown in figure.  
 Determine the single equivalent force and locate its point of intersection with the base AD, assuming all the forces to lie in the same plane.



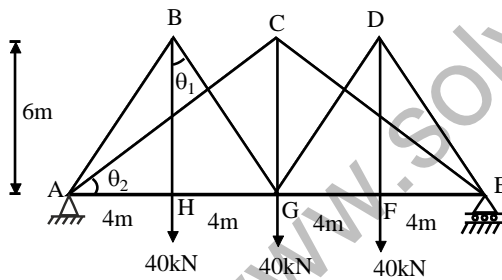
- b) Three forces  $F, P, Q$  act at point  $D$  as shown in figure  $F=90\text{N}$  and  $P=149\text{N}$ . Determine the magnitude of force  $Q$ ; so that the resultant of the three forces is parallel to 'Y' axis. 5



3. a) A bar 12.0 m long is supported by two inclined plane as shown in figure. Determine 'x' for the equilibrium of the bar. Assume smooth surfaces. 5



- b) For the truss shown in fig. compute the member forces  $BG, AC$  and  $HG$ . 5

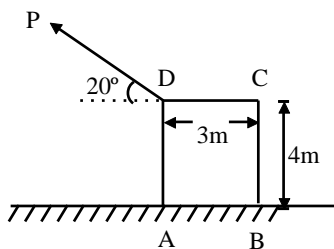


OR

4. a) What are the assumptions made in analysis of simple truss? 3

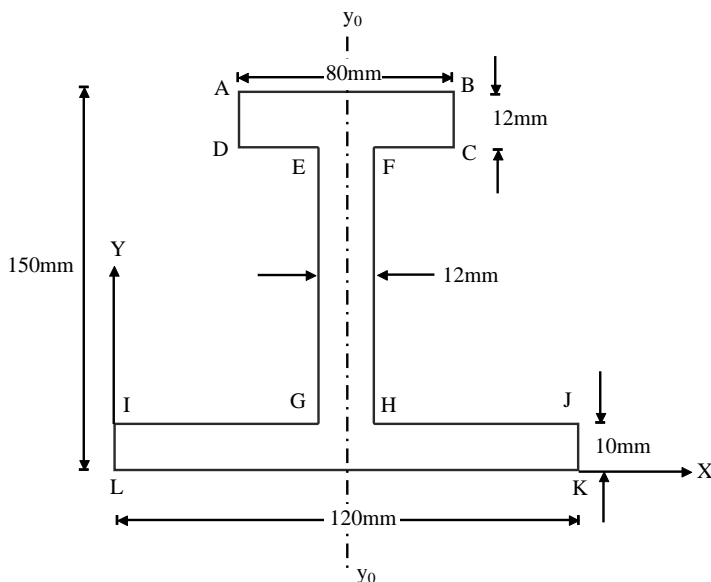
- b) A block of 700N is resting on a floor as shown in figure. Determine the value of  $P$ , which will cause the block to

- i) Move
  - ii) Tip
- Take  $\mu = 0.3$



- c) State coulomb's laws of dry friction. 2

5. a) Determine the centroid of the I section shown in figure with respect to the axes shown. Also find moment of Inertia about x-axis. 7

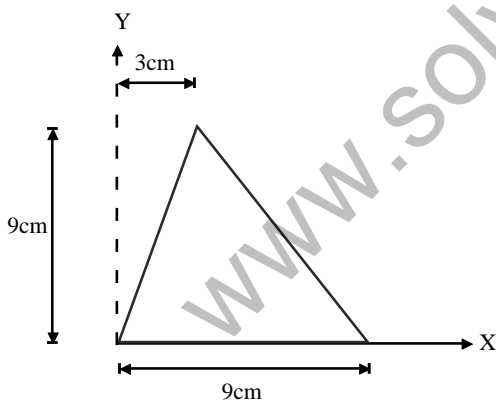


$Y_0$  axis is axis of symmetry.

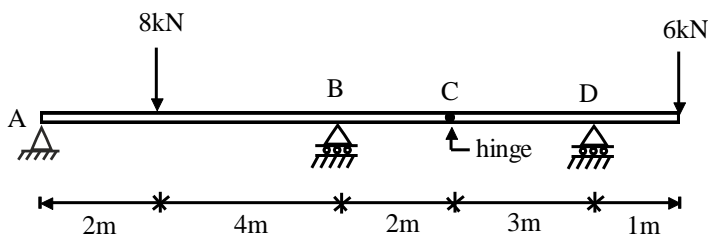
- b) State and explain the principle of virtual work. 3

OR

6. a) Compute the product of inertia of the triangle shown in fig. with respect to given X & Y - axis. 4



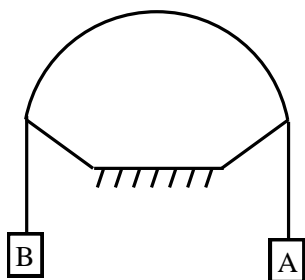
- b) Using virtual work method determine reactions at supports A, B and C for the beam shown in figure. 6



7. a) Explain D'Alembert's Principle. 3

- b) Referring to the figure, Assume A weighs 200N and B weighs 100N, determine acceleration of bodies if the coefficient of kinetic friction is 0.10 between the cable and the fixed drum.

7

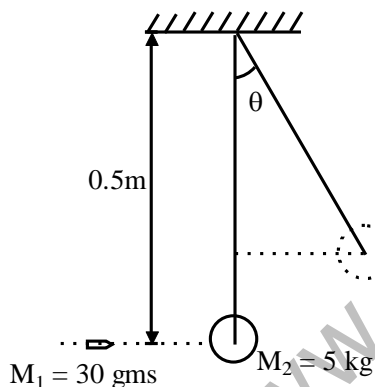


OR

8. A bullet of weight 30 gms moving with velocity of 100 m/sec hits a 5kg bob of a simple pendulum horizontally. Determine the maximum angle through which the pendulum string 0.5m long may swing if.

10

- The bullet get embedded in bob.
- The bullet escapes from the other end at 20m/sec.
- The bullet is rebounded from the surface of bob at 20m/sec.



\*\*\*\*\*