B.E - Bachelor of Engineering (CBCS Pattern) Second Semester CBCS

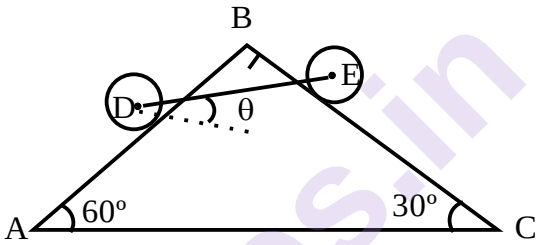
2BEAB05 - Engineering Mechanics

P. Pages : 5 **GUG/W/18/11475**

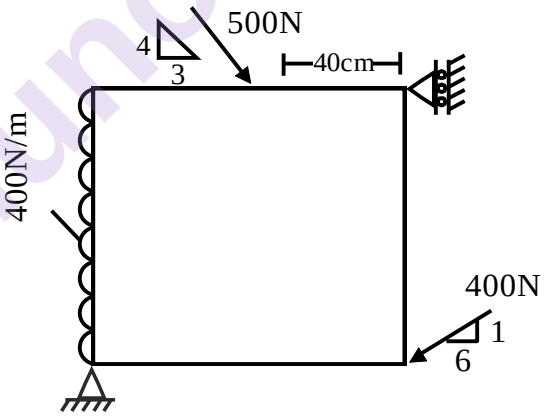
Time : Three Hours * 3 9 0 1 * Max. Marks : 80

Notes : 1. All questions carry equal marks.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Retain the construction lines.
5. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) Two roller of weight 60 N and 100 N are connected by flexible string DE and rest on two mutually perpendicular plane AB and BC find tension in string and angle θ. **8**

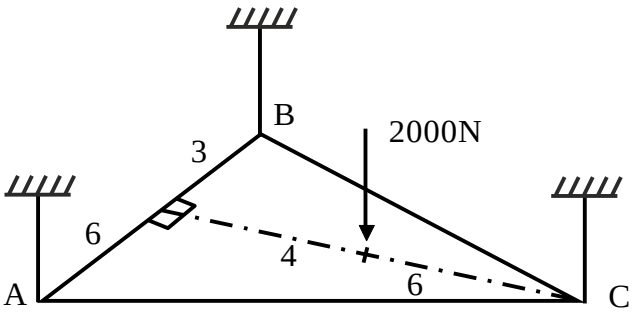


b) A square block ABCD of 80 cm dimension having its self weight 200 N is loaded and supported shown in fig determine support reaction. **8**

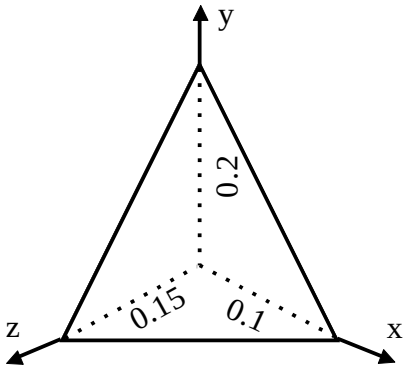


OR

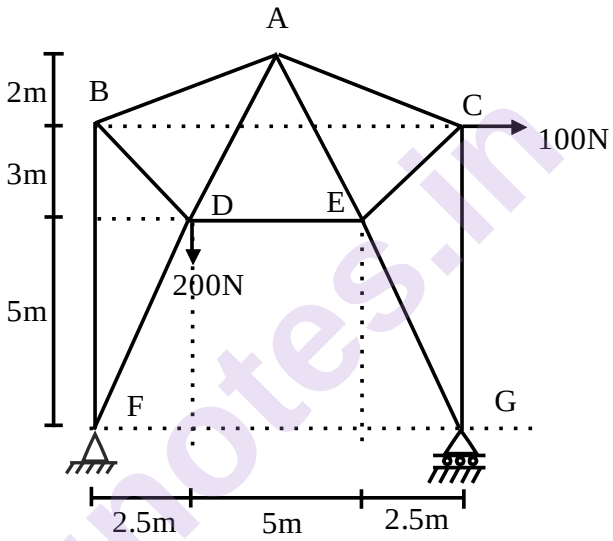
2. a) The triangular plate ABC shown in figure carries a load of 2000 N applied of E and is supported in horizontal position by three vertical cable attached at A, B and C compute tension each cable. **8**



b) A triangular plate is rest against the corner of a room. A moment of 30 Nm is required to start rotating about edge AC what is the least force applied at B to start this rotation. **8**



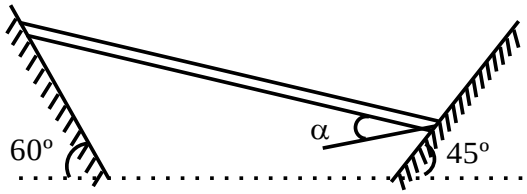
3. a) Find out forces in each member of pin jointed frame. **13**



b) State the assumptions made in the analysis of truss. **3**

OR

4. a) A uniform plank of weight w and total length 2L is placed as shown in fig below with its ends contact with inclined plane angle of friction is 15º determine the maximum value of angle α at which slipping impends. **8**



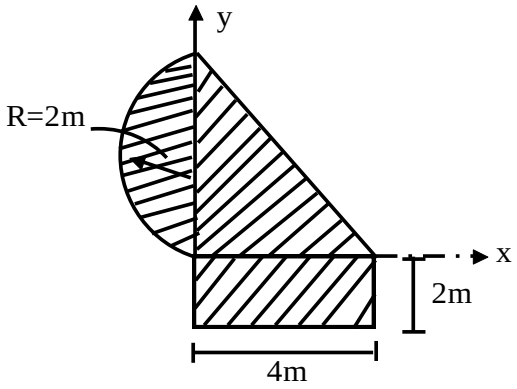
b) A differential wheel and axle with a velocity of 24 a load of 2000 N is lifted by an effort of 150 N and a load of 2500 N is lifted by 180 N effort estimate probable effort at a load of 3750 N also calculate : **8**

i) Effort wasted in friction
ii) The mechanical advantage
iii) The efficiency at its load

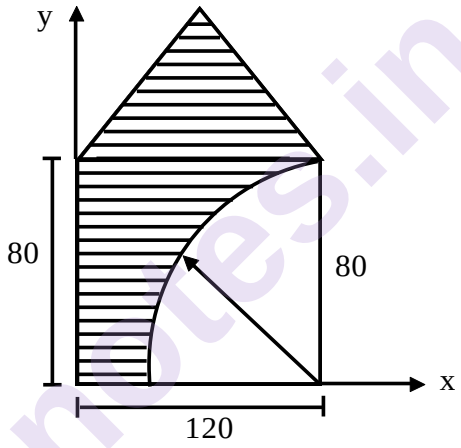
Also calculate maximum possible efficiency of the machine. State whether the machine is reversible or irreversible.

5. a) For the shaded area determine. **8**

i) Centroid with respect to x & y axis
ii) Moment of Inertia about centroidal xy axis
iii) Moment of inertia about principle axis

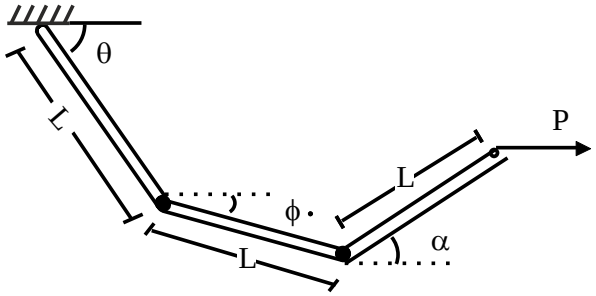


b) Find the co-ordinate of centroid and moment of inertia about centroidal x, y axis. **8**

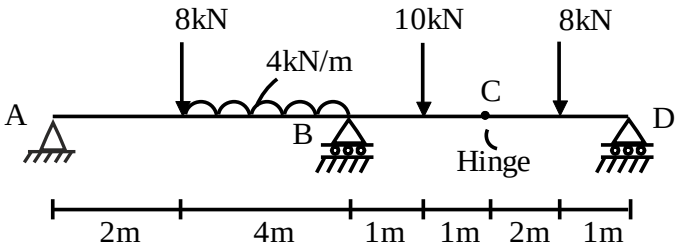


OR

6. a) A horizontal force P is applied to the end D of three identical links smoothly pinned together if each link is of weight w determine the equilibrium position by the angle **8**

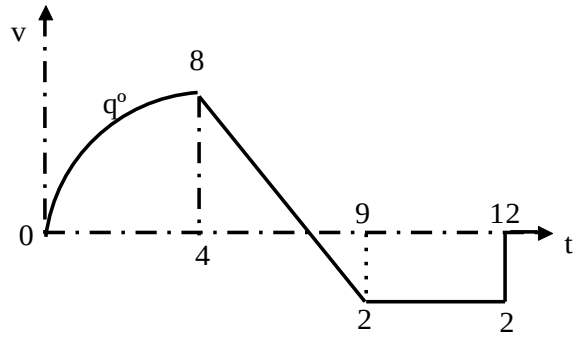


b) using virtual work determine reaction at support A, B and D for the beam shown below. **8**



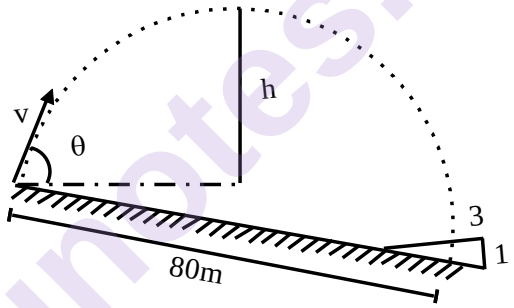
7. a) The motion of particle in a plane is defined by relation $r = 6t^2 - 2t^3$ and $\theta = 2t^2$ r - is in cm and θ - in radians particle start from origin at t = 0. Find the velocity and acceleration of particle when it return to its origin again. **8**

b) Motion of particle starting from rest is governed by V-t curve as shown in fig sketch at and st curve. **8**



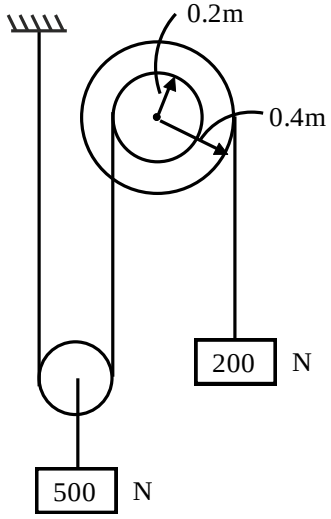
OR

8. a) In the following figure ball thrown down inclined strikes it at distance 80 m. If ball reach to a maximum height h = 21m above point of release compute initial velocity and inclination. **8**



b) A rectilinear motion of particle is governed by $a = 2\sqrt{v}$ where a - in m/s^2 v - in m/s at time t = 4 sec its velocity is 36 m/s and displacement is 72m find velocity displacement and acceleration at t = 6 sec. **8**

9. a) System of light pulley and in extensible wire determine the velocity of body A after it has move 3 m starting from rest assume pulley to be friction less and of negligible weight. **12**



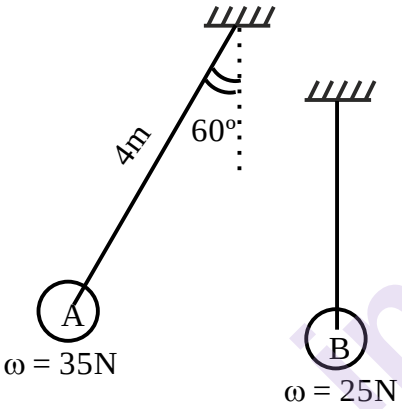
b) Define : **4**

i) Coefficient of Restitution.

ii) Momentum

OR

10. a) Ball A & B are attached to stiff rod of negligible weight. Ball A is released from rest shown in fig. below and allowed to strike B. If e = 0.6 determine the maximum angle ϕ through which B will swing what is the maximum and minimum tension in the rod attached to B. if impact lost for 0.01 sec also find average impact force. **14**



b) State D'Alemberts principles. **2**

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