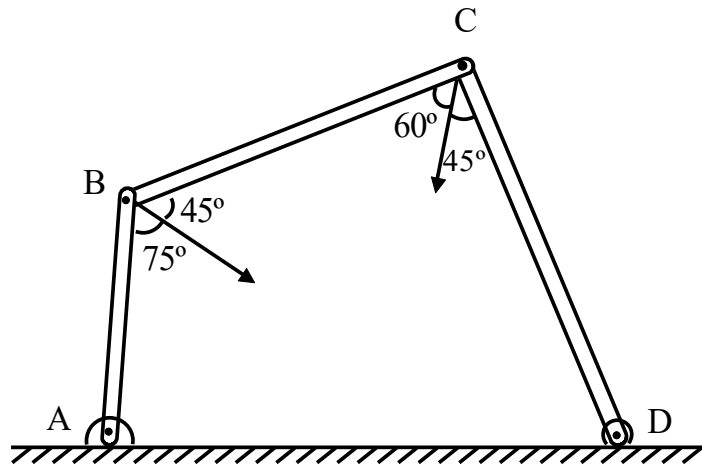




- Notes :
1. All questions carry equal marks.
 2. Due credit will be given to neatness and adequate dimensions.
 3. Assume suitable data wherever necessary.

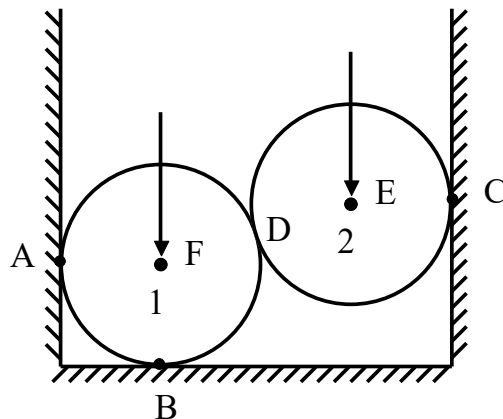
1. a) Three bars pinned together at B and C and supported by hinges at A and D as shown in figure. Form a four line mechanism. Determine the value of P that will prevent motion. **8**



- b) What do you understand by free body diagram? Explain with neat sketch. **4**
- c) State and explain Varignon's theorem. **4**

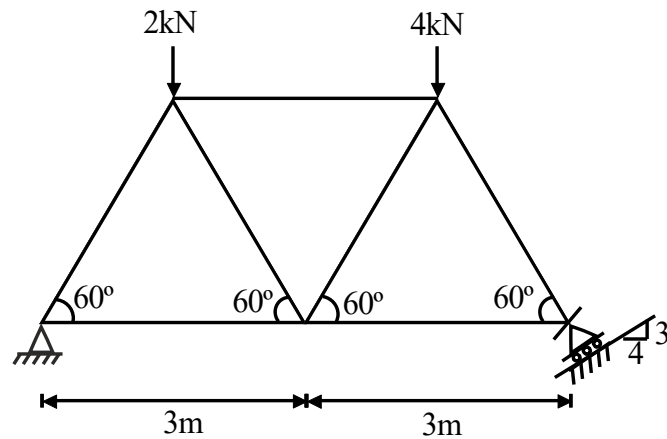
OR

2. a) Explain the principle of transmissibility of forces. **4**
- b) Two spheres each weight 1000N and radius 25cm rest in channel of width 90cm as shown in figure 1 find the reaction at a point of contact A, B & C. **8**



- c) State and explain Lami's theorem. **4**

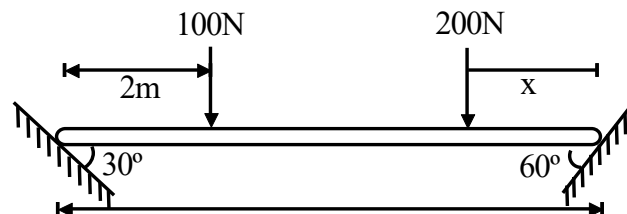
3. a) Explain the term friction and state the laws of friction. 5
- b) Using the method of joints, find the axial forces in all the members of a truss with the loading shown in figure. 11



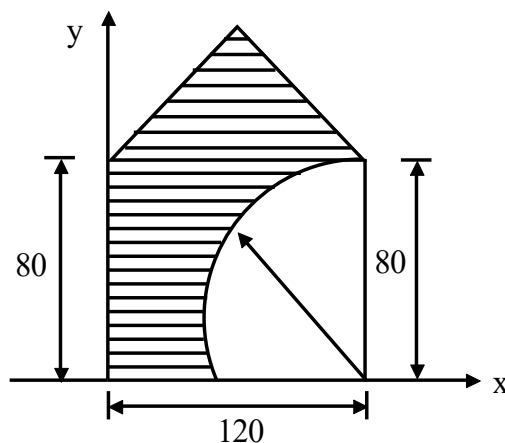
Figure

OR

4. a) A horizontal bar of 10m long and of negligible weight rest on a rough inclined planes as shown in figure. If the angle of friction is 15° , how close to B may the 200N force be applied before motion impends? 10



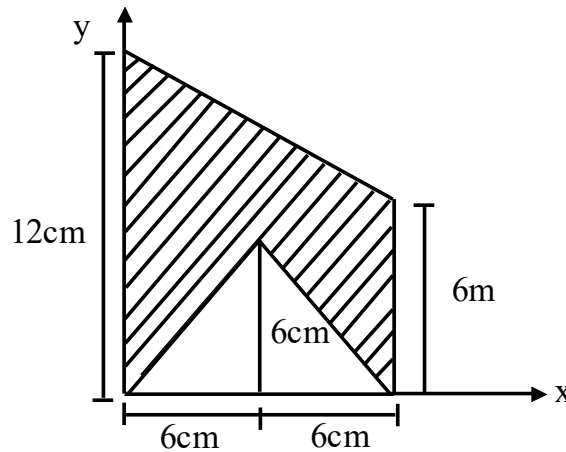
- b) Explain the following term: 6
- i) Limiting friction force
 - ii) Angle of repose
 - iii) Angle of friction
5. a) Find Co-ordinate of centroid and moment of inertia about centroidal x, y axis. 10



- b) State and explain perpendicular axis theorem and parallel axis theorem. 6

OR

6. a) Explain: 6
 i) Product of inertia.
 ii) Polar moment of inertia
 iii) Transfer theorem for moment of Inertia
- b) Determine the centroid of the lines that form the boundary of the shaded area shown in 10
 figure.



7. a) A ball is thrown vertically into the air at 36m/s, after 3 sec another ball is thrown vertically, 10
 initial velocity must the second ball have to pass the ball at 30 metre from the ground.
- b) Define: Rectilinear motion, Curvilinear motion, rotational motion & Relative motion. 6

OR

8. a) State and explain D'Alembert's principle with help of neat sketch. 6
- b) Three perfectly elastic balls A, B and C masses 2 kg, 4kg and 8 kg move along a line with 10.
 velocities 4m/s, 1m/s and 0.75m/s respectively. If the ball A and B which in turn strikes C
 determine the velocities of the three balls after impact.
9. a) If a particle in simple harmonic motion has an amplitude of 300mm and a period of 1sec, 8
 determine the displacement, velocity and acceleration after 0.4 sec from when the particle
 was at the right end of its path.
- b) What is vibration? What are reasons of vibration? 8

OR

10. a) Explain the concept of damping. 8
- b) Give the concept of simple harmonic motion. 8
