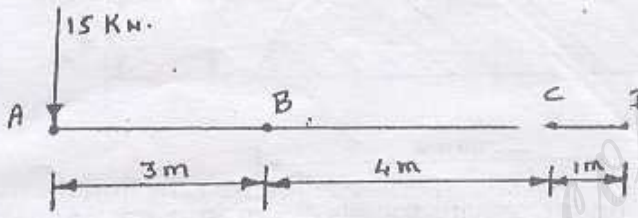
Con. 3391-08. Engineering Mechanics. CO-5158

(OLD COURSE)

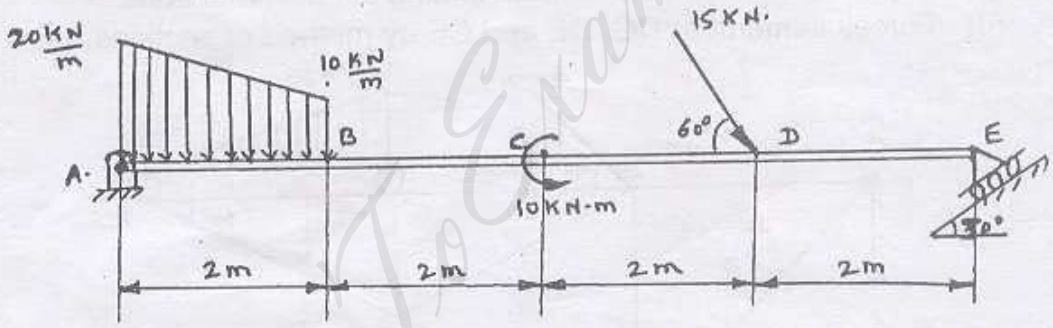
(3 Hours) [Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory**.
(2) Solve any **four** questions out of remaining **six**.
(3) Assume **suitable data** if **necessary** and **state** the **assumptions**.

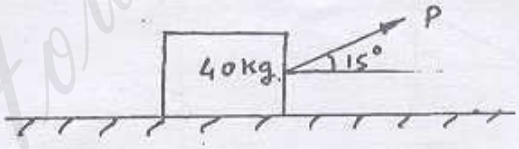
1. Solve any **four** of the following :—
(a) Resolve 15 kN force at 'A' into two parallel components at 'B' and 'C'. 5



(b) State and prove Varignon's Theorm. 5
(c) Calculate Support Reactions for following beam. 5

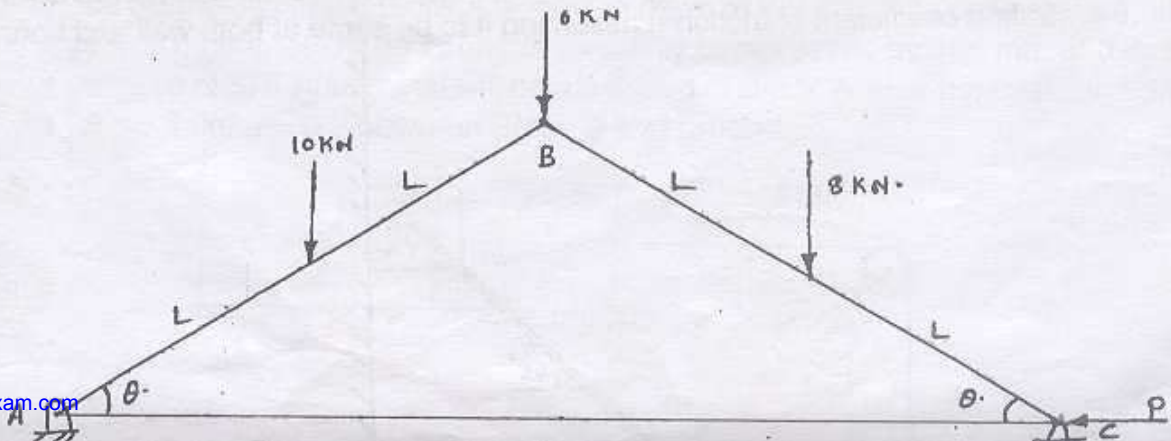


(d) Find Force 'P' required to accelerate the block shown in figure below at 2·5 m/s^2. Take $\mu = 0{\cdot}3$. 5

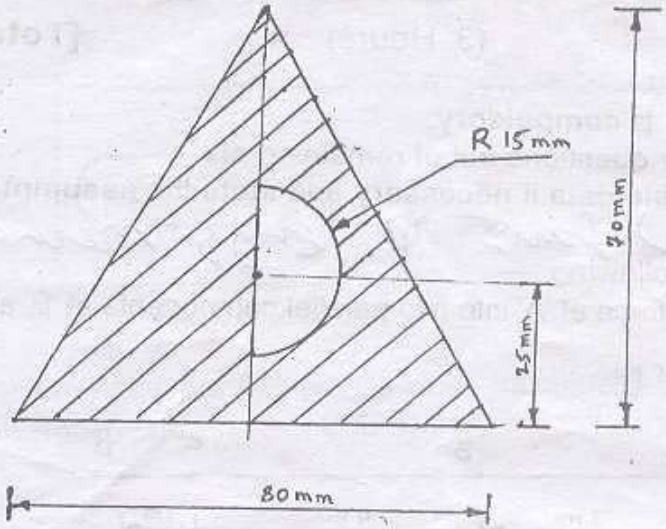


(e) Write a note on types of impact. 5

2. (a) A link mechanism shown in following **figure** is in equilibrium at $\theta = 30°$ due to the applied force 'P'. By principle of virtual work find the magnitude of 'P'. 10



(b) A semicircular hole is punched in a triangular sheet as shown in the **figure**. Find the moment of inertia of the shaded area about centroidal X-Axis— **10**

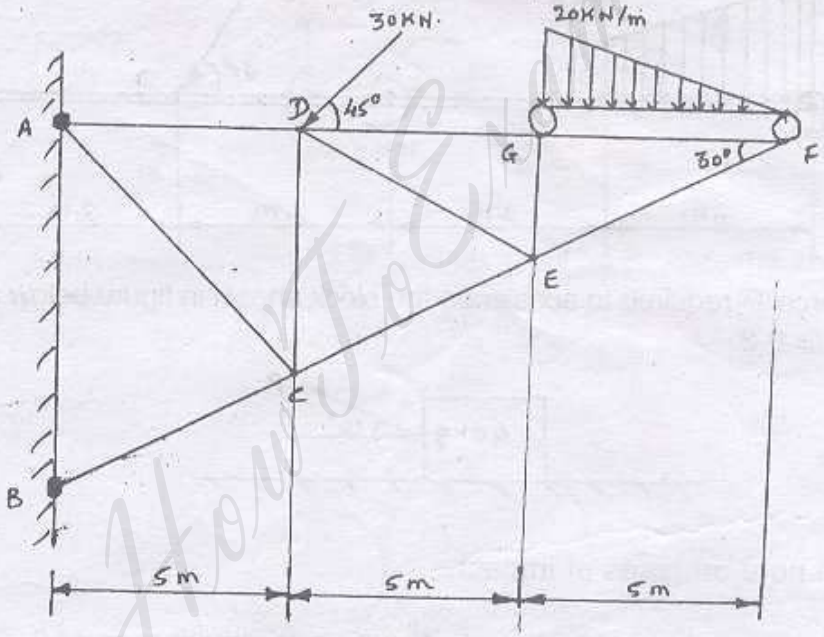


3. (a) A particle falling under gravity travels 25 m in a particular second. Find the distance travelled by it in next 3 seconds. Take $g = 9.81\ m/s^2$. **10**

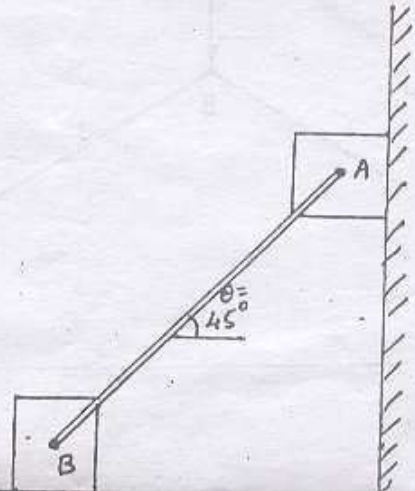
(b) For the following truss determine :— **10**

(i) Forces in all members without finding support reactions.

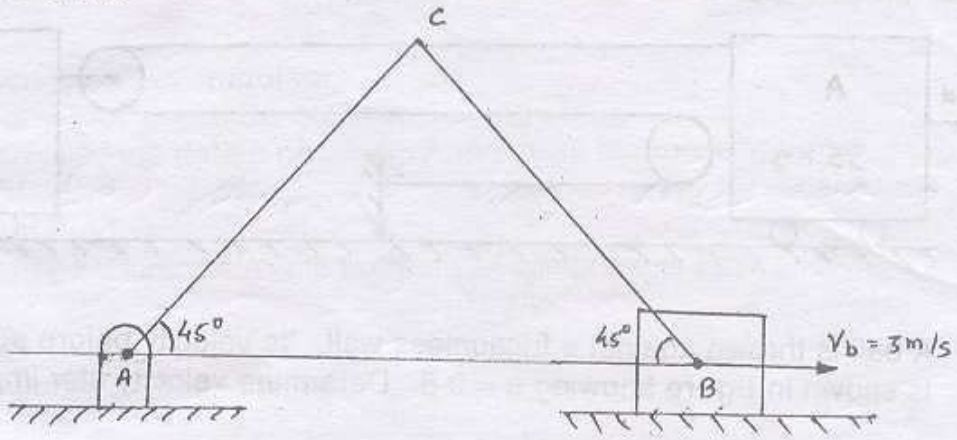
(ii) Forces in member DG, DE and CE by method of sections.



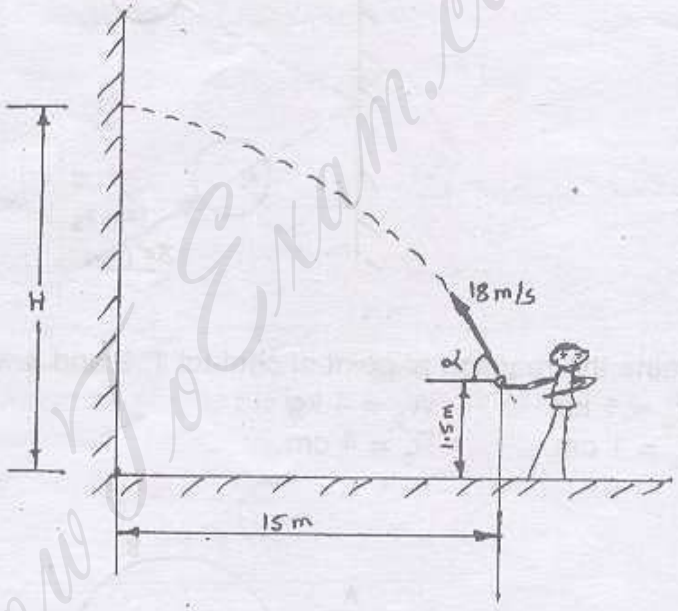
4. (a) Two identical blocks A and B are connected by a rod and rest against vertical and horizontal planes respectively as shown in **figure**. If sliding impends when $\theta = 45°$ find coefficient of friction μ assuming it to be same at both wall and floor. **10**



(b) Black 'B' shown in **figure** moves with the speed of 3 m/s. Determine velocity of link AC and BC and the velocity of point 'C' at the instant shown. Take length AC = BC = 0·5 m. 10



5. (a) A player throws a ball with an initial velocity of 18 m/s from point 'A' as shown in **figure**. Find maximum height 'H' at which ball can strike the wall and the corresponding angle 'α'. Take g = 10 m/s^2. 10

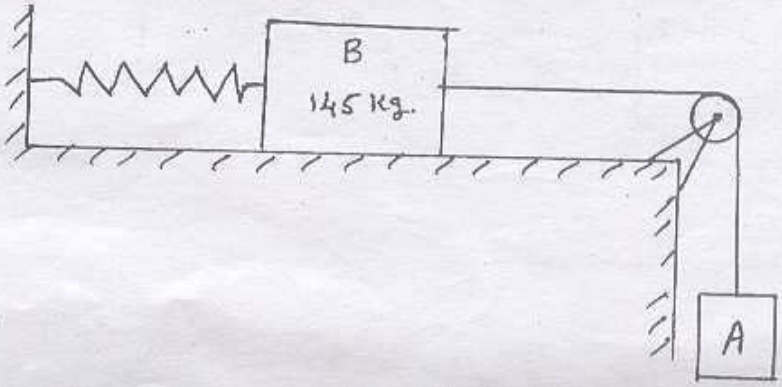


(b) A partical moves in a circular path of 9 m radius, calculate after 4 secs later the particle's total acceleration and distance travelled if— 10

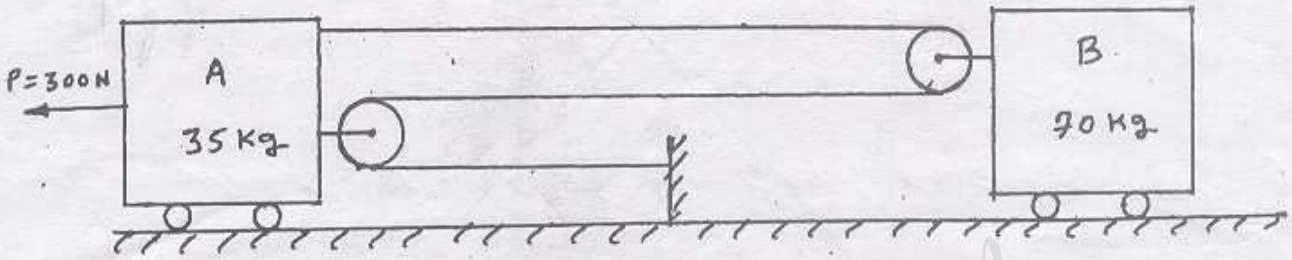
(i) speed is constant at 3 m/s

(ii) speed is 3 m/s at the instant and is increasing at a rate of 0·7 m/s^2.

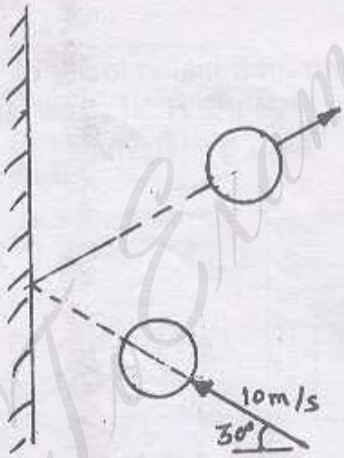
6. (a) In the **figure** shown the Block A is moving down at 1·5 m/s. The pulley is weightless and frictionless. The spring is originally compressed by 150 mm and has a stiffness of 875 N/m. What will be the speed of Block 'A' after it moves through 1·25 m. Take μ = 0·2 between Block B and ground. 10



(b) Determine acceleration of A and B and the tension in the cable due to application of 300 N force as shown in **figure**. Neglect friction and mass of pulleys. **10**



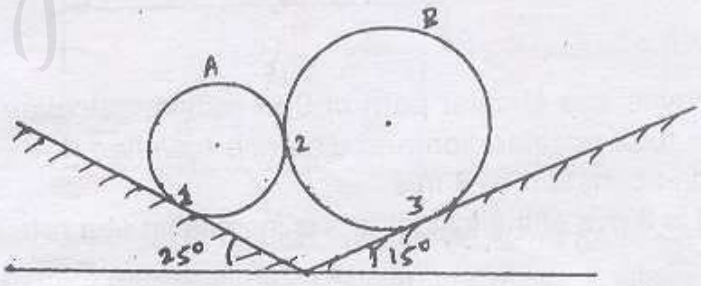
7. (a) A ball is thrown against a frictionless wall. Its velocity before striking the wall is shown in **figure** knowing e = 0·8. Determine velocity ater impact. **10**



(b) Determine the reaction at point of contact 1, 2 and 3. Assume smooth surfaces. **10**

W_a = 1 kg W_b = 4 kg

R_a = 1 cm R_b = 4 cm.



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