Dr. Babasaheb Ambedkar Technological University, Lonere-Raigad

END SEMETERExaminations - APRIL - 2017

I Semester: B. Tech Course (Computer, Electrical, EXTC and IT)

Subject: Engineering Mechanics (EM)

Date:

28 APR 2017

Time: 3 Hours

Max Marks: 60

Instructions to the Students:

- 1. Attempt ANY FIVE Questions from Question No 1 to Question No 6.
- 2. Illustrate your answers with neat sketches, diagrams etc. wherever necessary.
- 3. Necessary data is given in the respective questions. If such data is not given, it means that the knowledge of that part is a part of examination.
- Q.1. Attempt the following

(04X3=12)

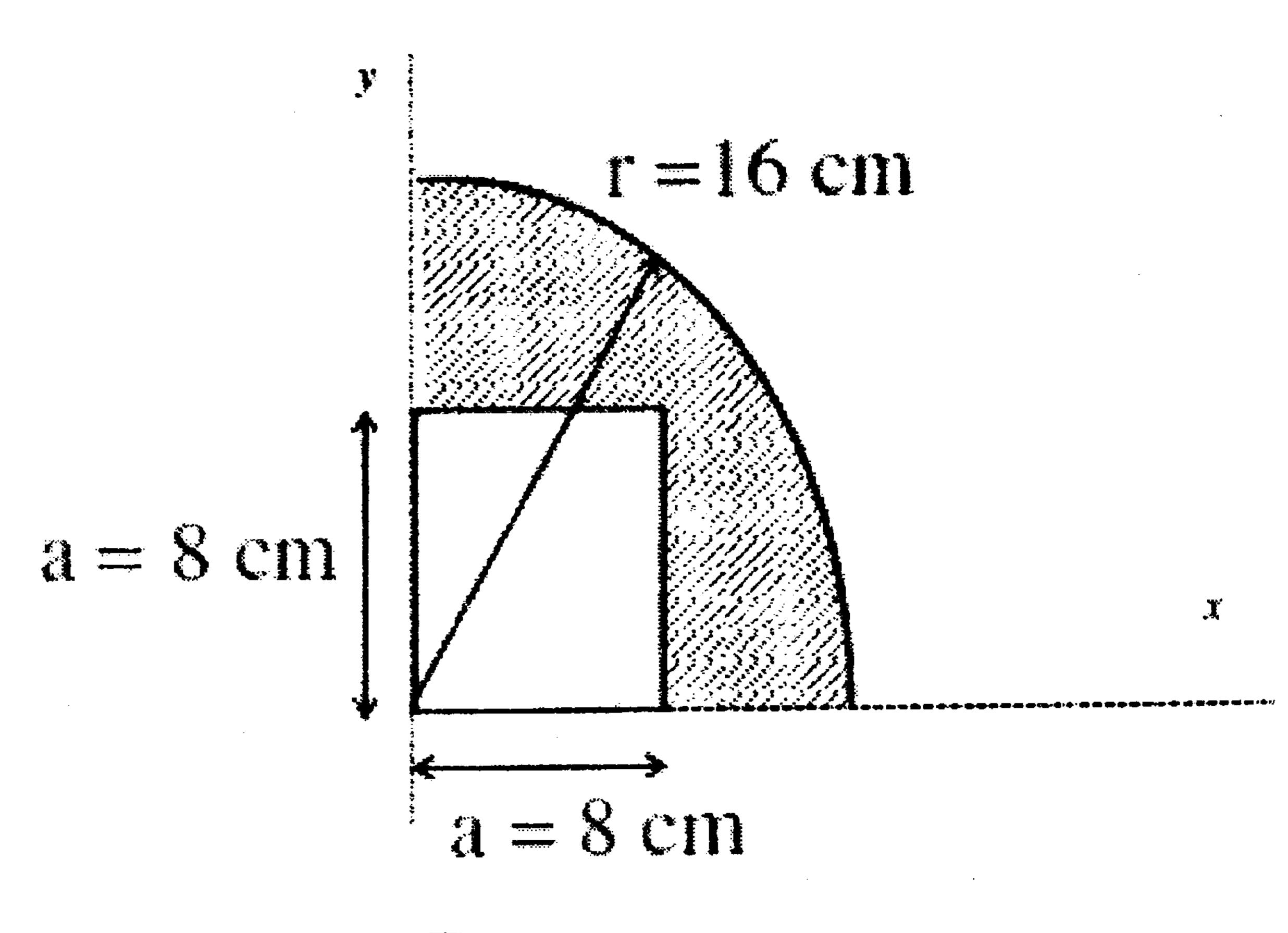
- A) Explain various types of loads.
- B) State Law of Parallelogram of forces. Two forces of 22 N and 45 N act away from a point. If the angle between the forces is 50°. Find the magnitude of the resultant and the angle made by it with the 22 N force.
- C) The rectilinear motion of a particle has its position defined by the relation $X=t^3-8t^2+24t-15$ m

Determine 1) Position, velocity and acceleration at t = 3 sec

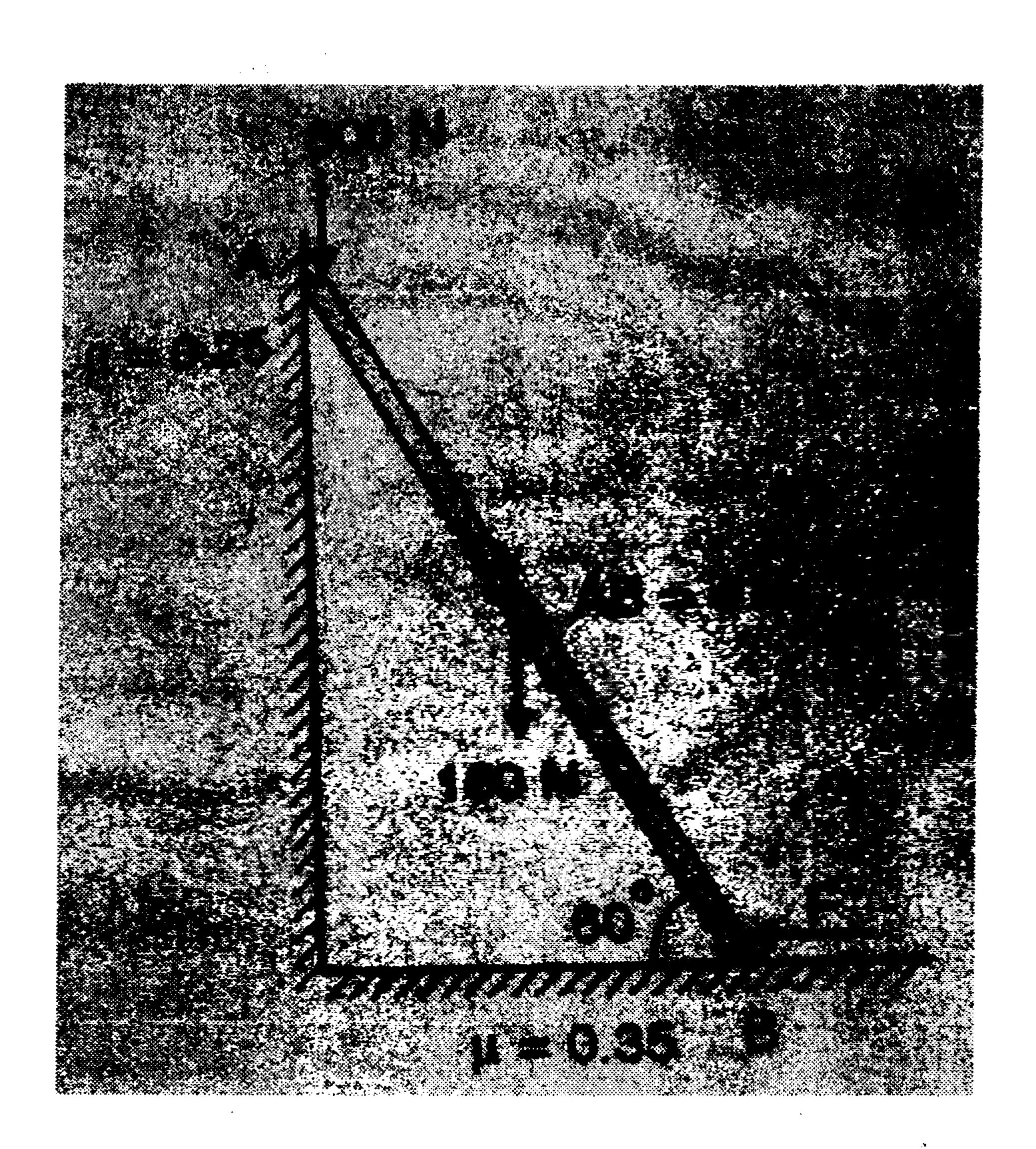
- 2) Maximum Velocity and the corresponding time
- Q.2. Attempt the following

(04X3=12)

- A) State and prove Lami's Theorem
- B) Find the location of centroid for shaded area with respect to reference axis X-Y.



C) A 4 m long ladder, weighing 160 N is resting as shown, making a 60 degree angle with the ground. A man weighing 800 N is standing at the top of the ladder. Find the minimum force F required to keep the ladder in equilibrium.



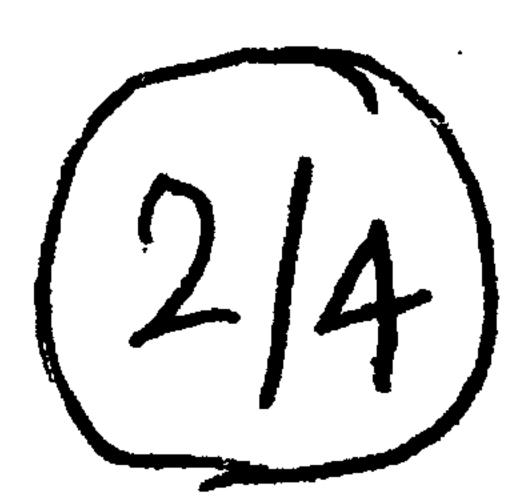
Q.3. Attempt the following

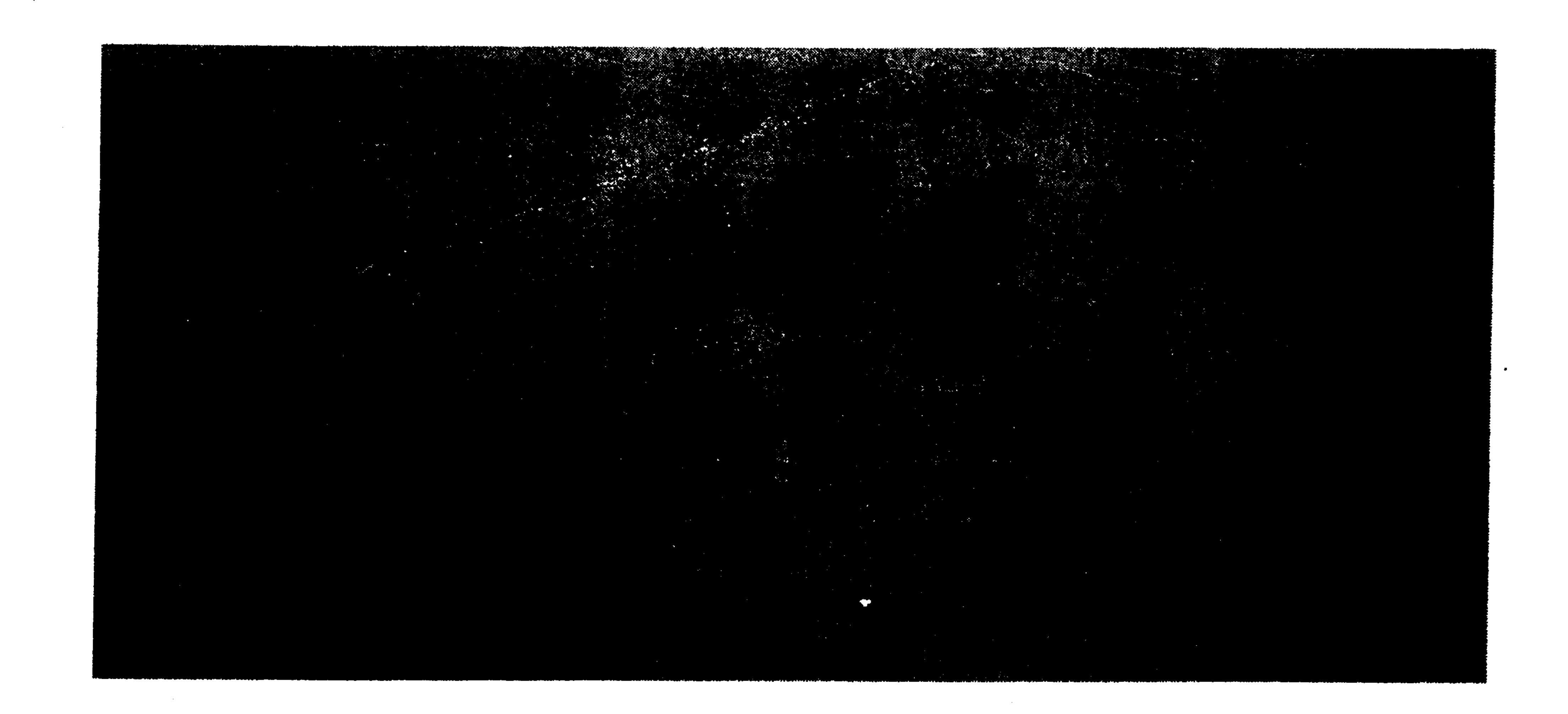
(04X3=12)

- A) State and Derive the Impulse Momentum Equation.
- B) A stone is dropped into a deep well. The splash/sound is heard after 2.5 seconds. Assuming the speed of sound to be 330 m/s, Find the depth of the well (take $g = 9.81 \text{ m/s}^2$).
- C) Ball A of mass 0.5 Kg moving to the right with a velocity of 5 m/s has a direct central impact with ball B of mass 0.2 Kg moving to left with a velocity of 2 m/s. If after impact the velocity of ball B is observed to be 4 m/s to the right. Determine the coefficient of restitution between the two balls.
- Q.4. Attempt the following

(06X2=12)

- A) Two men, M_1 of mass 50 kg and M_2 of mass 75 kg, dive off the end of a boat of mass M=250 kg so that their relative velocity with respect to the boat is 4 m/s. If the boat is initially at rest, find its final velocity if
- i) two men dive simultaneously,
- ii) the man of mass 75 kg dives first followed by the man of mass 50 kg,
- iii) the man of mass 50 kg dives first followed by the man of mass 75 kg

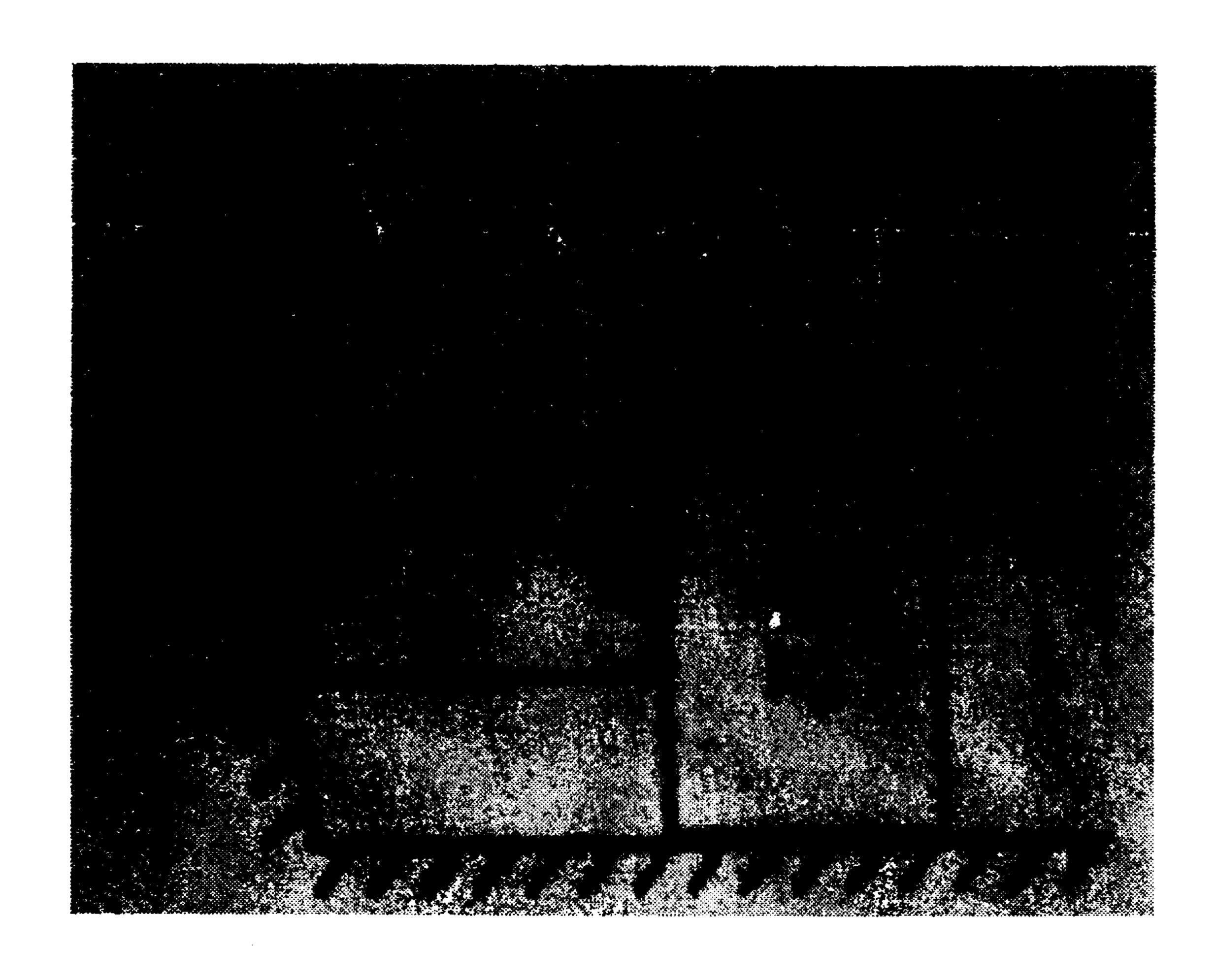




- B) Write a note on Free Body Diagram (FBD). Explanin the various types of supports in detail with neat FBD.
- Q.5. Attempt the following

(06X2=12)

A) The horizontal position of the 1000 kg block is adjusted by 6 degree wedge. If coefficient of friction for all surfaces is 0.6. Determine the least value of force P required to move the block.



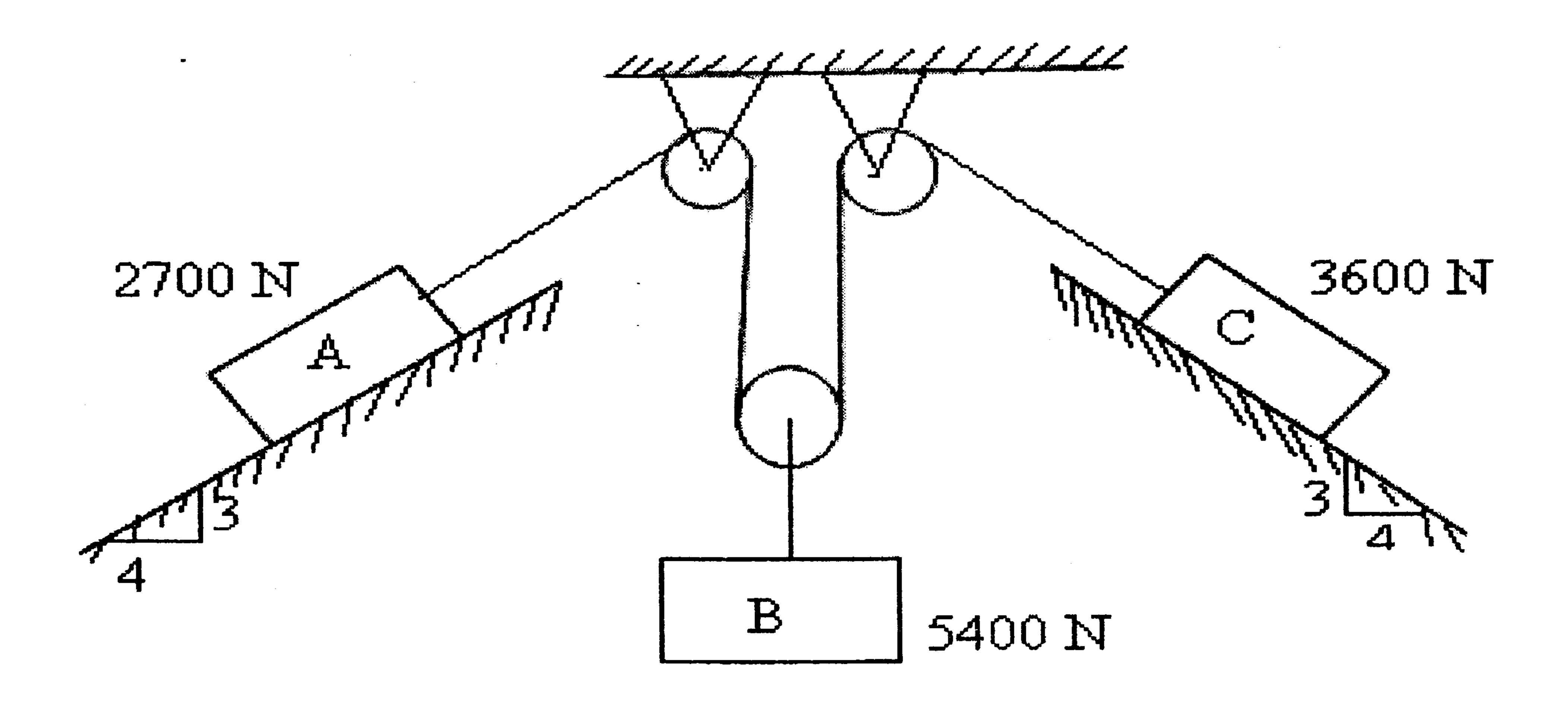
- B) Explain and prove D'Alembert's principle. How will you explain the concept of dynamic equilibrium.
- Q.6. Attempt the following

(06X2=12)

- A) Define and Explain following terms related to friction.
 - i) Angle of Friction
 - ii) Angle of Repose
 - iii) Coefficient of friction



B) If the coefficient of kinetic friction is 0.35 under each body in the system shown in fig., how far and in what direction will body B move in 6 sec. starting from rest. Pulleys are frictionless.



END OF QUESTION PAPER

