Question Paper

Exam Date & Time: 19-Nov-2018 (02:00 PM - 05:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTER FOR APPLIED SCIENCES
FIRST SEMESTER B.SC APPLIED SCIENCES THEORY EXAMINATION
NOVEMBER 2018
Engineering Statics and Dynamics [CE 111]

Marks: 100 **Duration: 180 mins.**

Answer 5 out of 8 questions.

1) i) State and prove parallelogram law of forces (8)
ii) State and explain transmissibility of forces

1A)

1B) Calculate magnitude of the resultant of the force system shown in figure with respect to point O and locate it. (12)

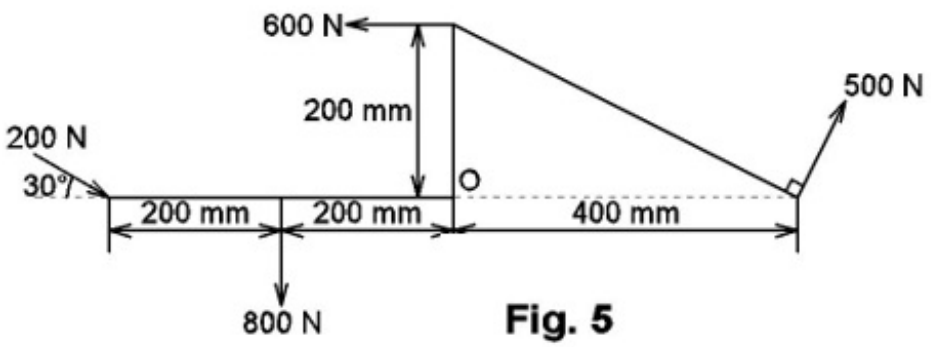
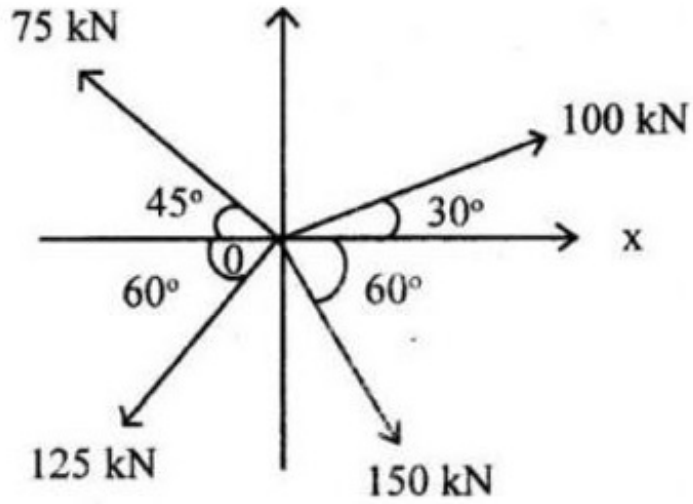


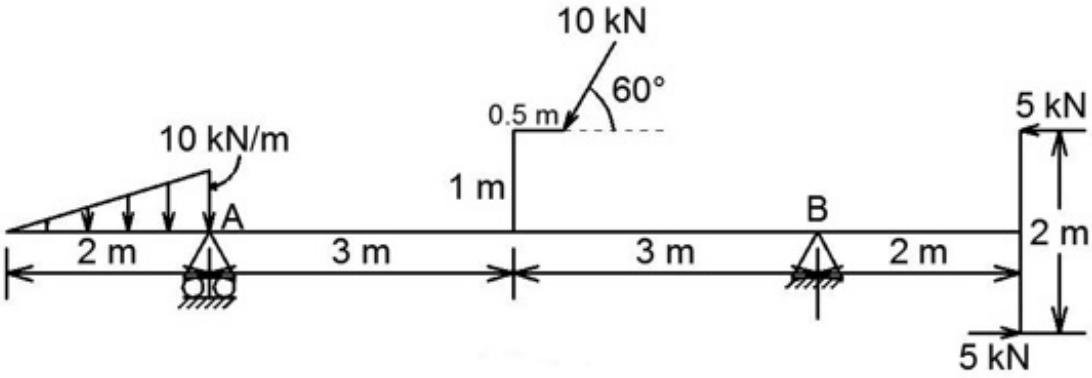
Fig. 5

2) Determine the unknown fifth force in the system of co-planar concurrent forces shown, if the resultant 130kN is in the direction of positive x axis away from O. (8)

2A)

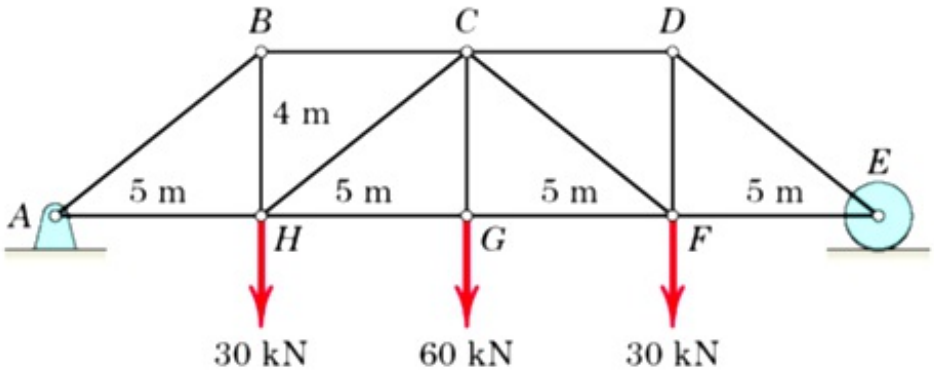


2B) Find the support reactions at A and B for the beam loaded as shown in the figure below. (12)



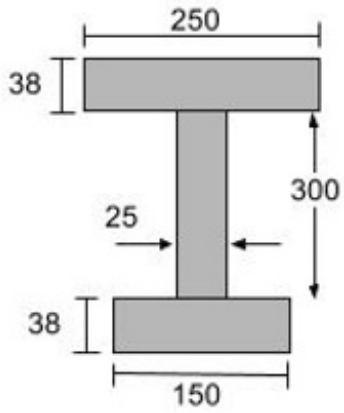
3) Determine the force in each member of the loaded truss by Method of Joints. (15)

3A)



3B) Locate centroid of I section shown in the figure. (Note: All (5)

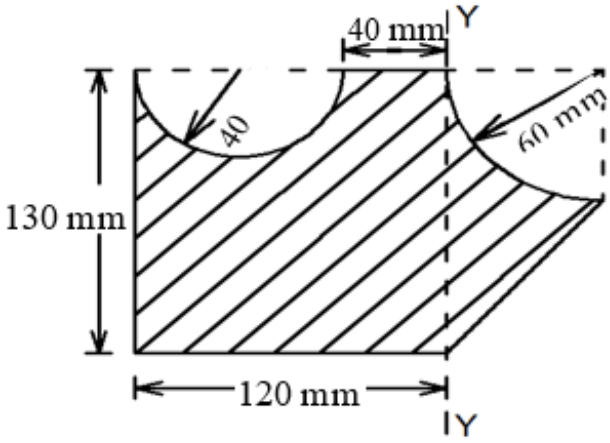
dimensions are in mm)



4) Obtain expression to locate centroid of right angle triangular area from first principle. (8)

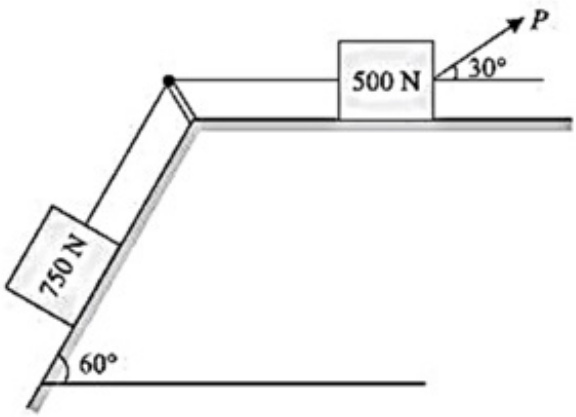
4A)

4B) Determine second moment of area of the hatched portion with respect to Y - Y axis shown. (12)

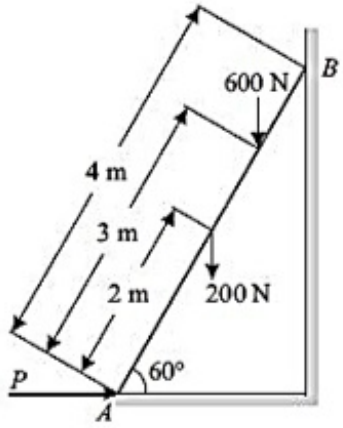


5) What magnitude of force P causes the motion of 500N block to the right? Assume the pulley is smooth and the co-efficient of friction b/w other contacts is 0.2. (10)

5A)



5B) A ladder of length 4m, weighing 200N is placed against a vertical wall as shown. The co-efficient friction b/w the wall and ladder is 0.2 and that b/w the floor and the ladder is 0.3. In addition to self-weight, the ladder has to support a man weighing 600N at a distance 3m from A. Calculate the minimum horizontal force to be applied at A to prevent slipping. (10)



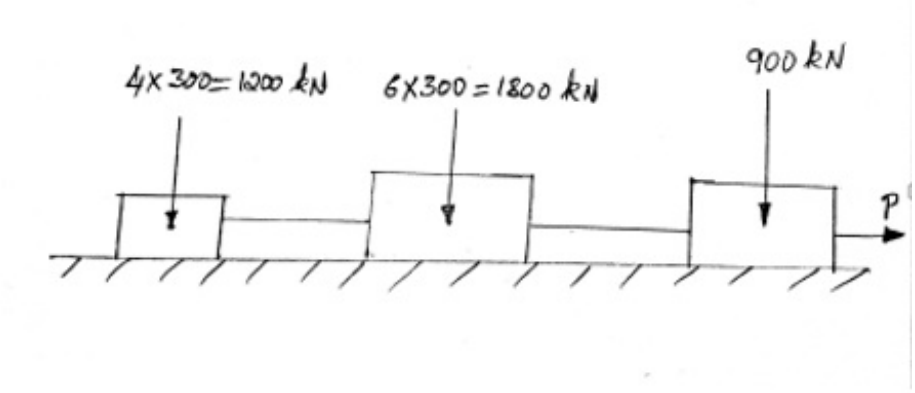
6) Derive work-energy relationship for translation. (6)

6A)

6B) A man weighing 1000N moves horizontally with a velocity of 5m/s and jumps on to a boat which is at rest and at the same level. If the boat weighs 3500N, what is the velocity of both? What is the distance travelled before coming to rest if they are subjected to an opposing force of 50N? (6)

6C) A locomotive weighing 900 kN pulls a train of 10 coaches each weighing 300 kN at 72 kmph on a level track against a resistance of 9 N/kN. If the rear 4 coaches get snapped from the train, find the speed of the engine and the remaining coaches after 150 secs. Assume no change in resistance and draw bar pull. Find also distance traveled by (8)

detached coaches before coming to rest.

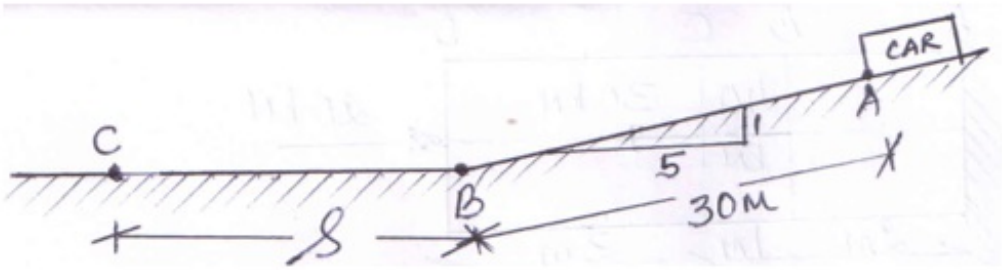


7) State and explain D'Alembert's Principle. (4)

7A)

7B) A motorist traveling at a speed of 72kmph suddenly applies his brakes and comes to a stop after skidding 65m. Determine (8)
a.Time required for the car to stop
b.The coefficient of friction between the tyres and the pavement.

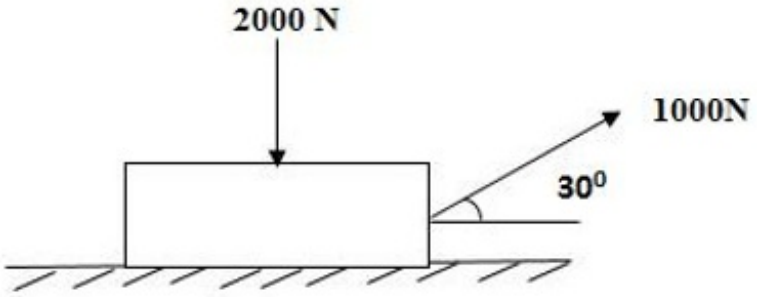
7C) A 1200 kg mass car is released down the slope of 1 in 5 with its engine shuts off. The car covers a distance of 30 m on the sloping track AB to enter the level track BC as shown in fig. Determine the distance travelled by the car on the level track before comes to rest. The track resistance is 200 N. Also find the velocity of the car at B. (8)



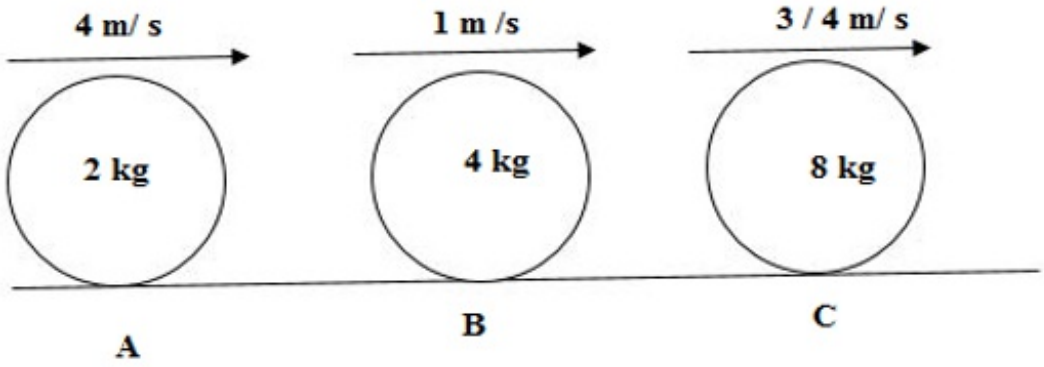
8) Briefly explain two types of impact . (4)

8A)

8B) A block weighing 1500N rests on a level horizontal floor for which μ = 0.2. This block is pulled by a force of 1000N at an angle of 20^0 to horizontal. Find the velocity of block after it moves 30m starting from rest. (6)



8C) Three bodies A, B & C of masses 2kg, 4kg and 8kg respectively move along same straight line and in the same direction with velocities 4m/s, 1m/s and (3/4) m/s. If A collides with B and subsequently B collides with C. Show that A & B will be brought to rest by collision. Take impact to be elastic. (10)



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