FE104

Total No. of Printed Pages:07

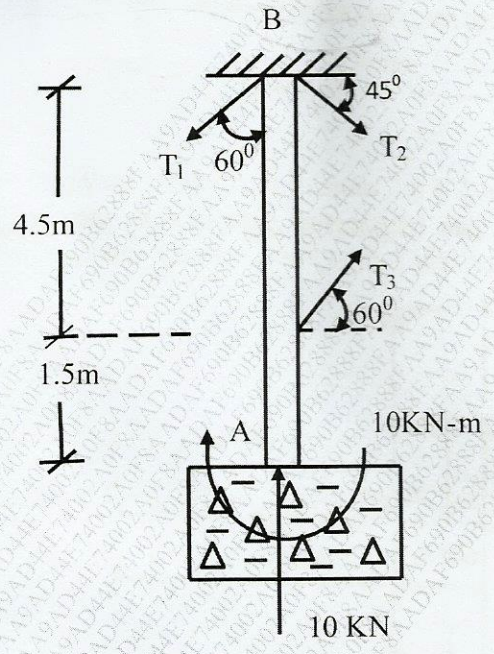
F.E. (Sem - I) (Revised Course 2016-17)
EXAMINATION MAY/JUNE 2019
Engineering Mechanics

[Duration : Three Hours] **[Total Marks : 100]**

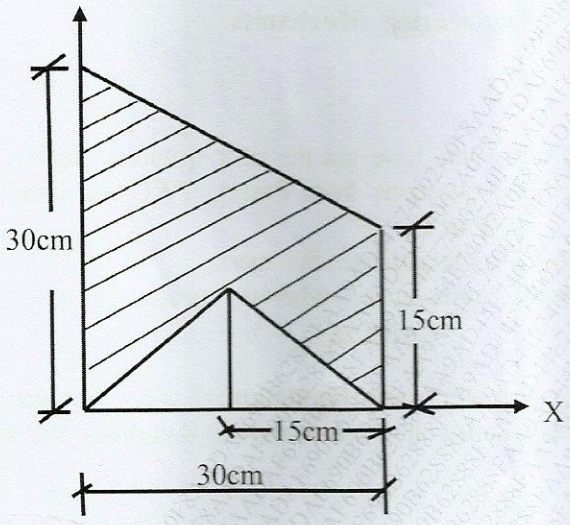
Instructions:
Please check whether you have got the right question paper.
1. Attempt TWO questions from Part A, TWO questions from Part B and ONE question from Part C.
2. Figures to the right indicate full marks
3. Make suitable assumptions wherever necessary.

PART A

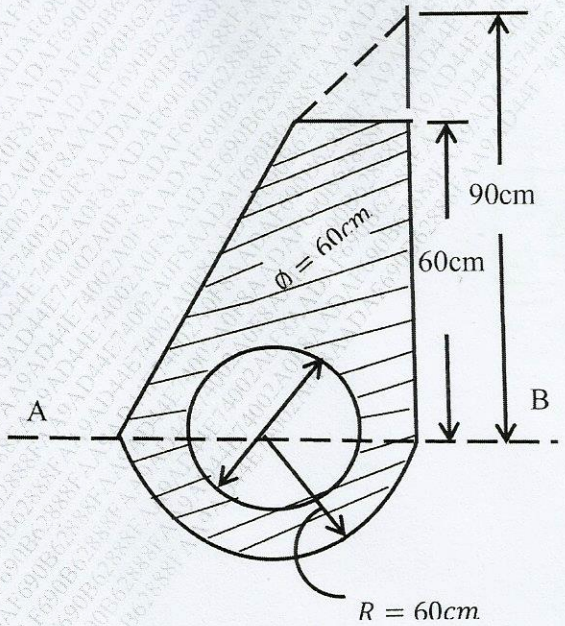
Q.1 a) A vertical pole is anchored in a concrete foundation. 3 wires are attached to the pole as shown in fig Q1(a). if the reaction at A are as shown, determine the forces in all the 3 wires. **10**



b) Determine the position of the centroid of the shaded area with respect to the X and Y axis marked on the figure (fig Q1 b.) (all dimension are in cms) **10**



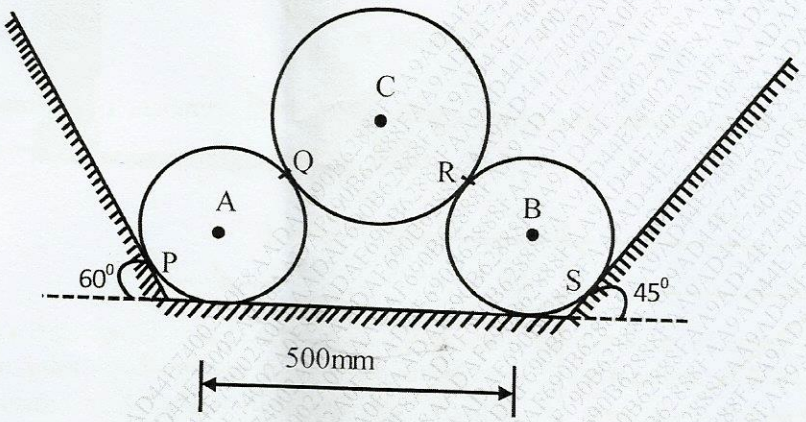
Q.2 a) Calculate the moment of Inertia and radius of gyration of the shaded area about the axis AB **10**



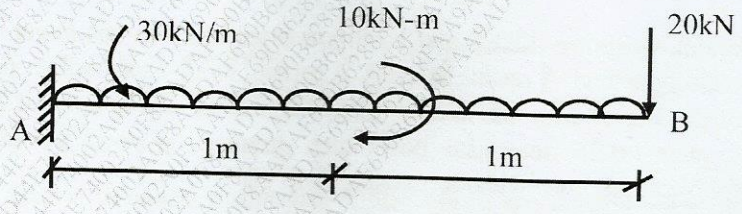
b) Three spheres are piled in a trench as shown in fig. Self-weight & radii of the cylinders are as given below: **10**

W_A = 2 kN r_A = 400mm
W_B = 2 kN r_B = 400mm
W_C = 4 kN r_C = 600mm

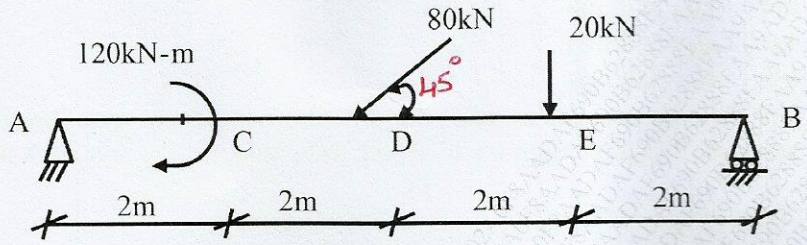
Treating all the contact surfaces as smooth, determine the reactions developed at the contact surfaces P,Q,R, & S; given to center distance between sphere A and B is 500mm.



.3 a) A cantilever beam A-B of span 2m is loaded as shown in the figure below. (fig Q3 a.) Determine the reactions at the fixed end. If the position of the point load is changed, will the reactions change? justify your answer. **10**

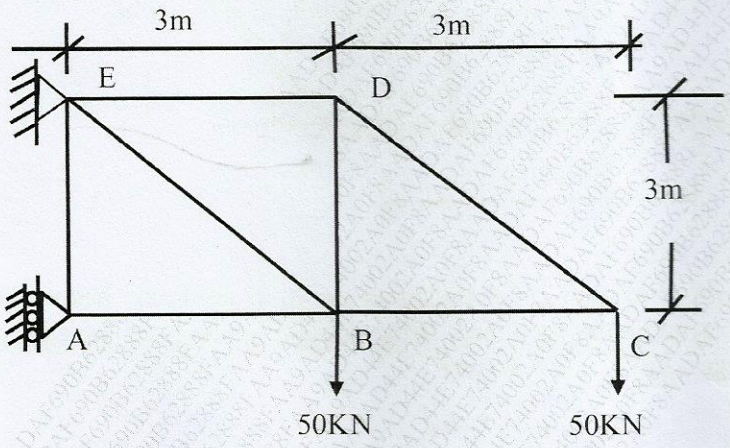


b) A beam A-B of span 8m is loaded as shown in the figure below. (fig Q3 b.) Determine the reactions at A and B by using principle of virtual work. **10**

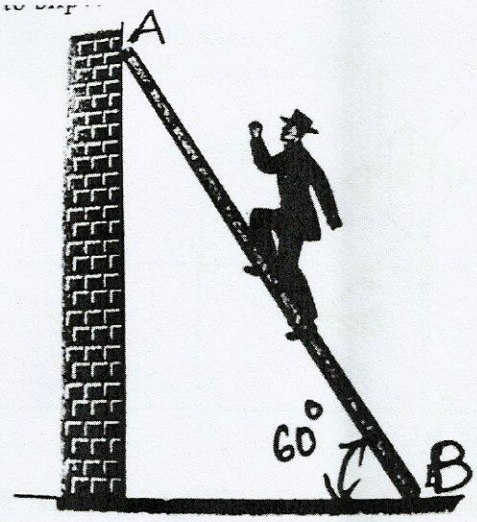


PART B

Q.4 a) Determine the magnitude and nature of forces in all the members of the truss. Tabulate the results. **10**

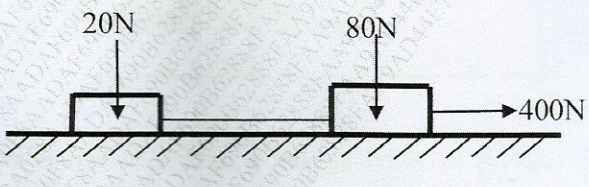


b) A uniform ladder weighing 120 N and having a length of 3 m has lower end B resting on the ground and upper end A resting against a vertical wall as shown in fig Q4b. the inclination of the ladder with the horizontal is 60^0. If the coefficient of friction at all surfaces of contact I 0.25, determine how much distance up along the ladder, a man weighing 650 N can ascents without causing it to slip? **10**



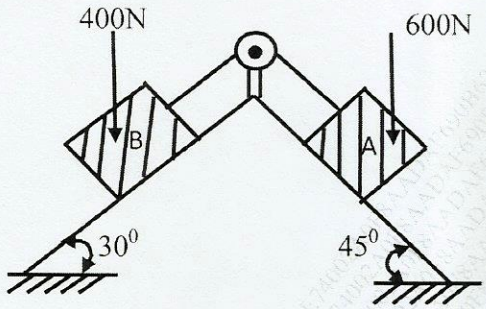
Q.5 a) In a differential wheel and axle arrangement, the diameter of wheel is 20 cm and that of the axles are 8 cm and 4 cm. if the efficiency of the machine is 80%, calculate the effort required to lift a load of 300N. Also calculate the number of revolutions the machine would make in lifting the load through a distance of 25 cm. **10**

b) Two weights are connected by a cord as shown in fig Q5b. a horizontal force of 400N is applied to the system. Determine the acceleration of the system and also the tension in the cord. Use D' Alembert's principle. Assume coefficient of friction as 0.3. **10**



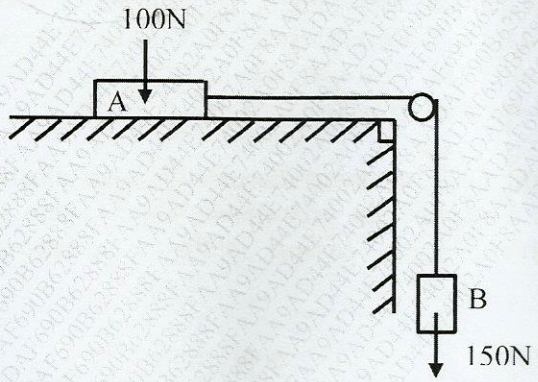
Q.6 a) In a double threaded worm and worm wheel, the number of teeth on the worm wheel is 60. The diameter of the effort wheel is 40 cm and that of the load drum is 20 cm. calculate the velocity ratio. If the efficiency of the machine is 50%, determine the effort required to lift a load of 1.5 kN. **10**

b) Determine the distance covered by block A to attain a velocity of 3m/s starting from rest. Assume pulley is smooth and coefficient of friction is 0.2. use work Energy method. **10**

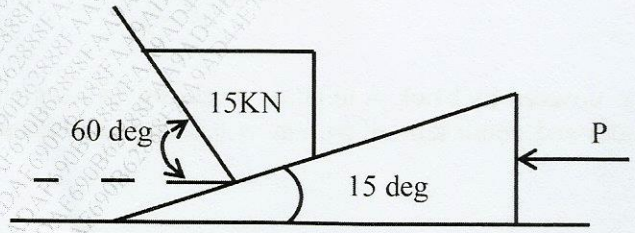


PART C

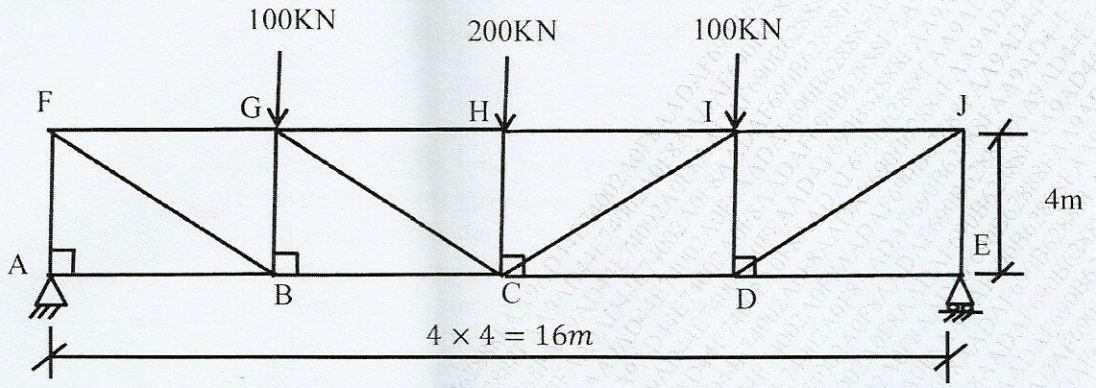
Q.7 a) The system show in the figure has a rightward velocity of 4 m/sec. determine its velocity after 5 sec. assume coefficient of friction as 0.2 for all contact surfaces. Use impulse Momentum Principle. What is the tension in the spring? **10**



b) A block weighing 15kN is to raised against a surface, which is inclined at 60^0 with the horizontal by means of a 15^0 wedge as shown in fig Q7b below. Determine the horizontal force P which will just start moving the block, if the coefficient of friction between all the surfaces of contact is 0.2. **10**



.8 a) For a pin joined truss shown in the figure (Fig Q 8a) , determine the magnitude and nature of forces in the members FG, BG and BC by method of sections. **10**



b) Determine the centroid of the shaded area shown in the figure Q8b. also determine the M.I. about centroidal X-X and Y-Y axis. **10**