FE104

Total No. of Printed Pages:06

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

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

Instructions:

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

1. a) Determine the angle $'a'$ for which the moment of the 500 N force shown in Figure Q1(a), is maximum about $'O'$. Also find the maximum moment. **(08)**

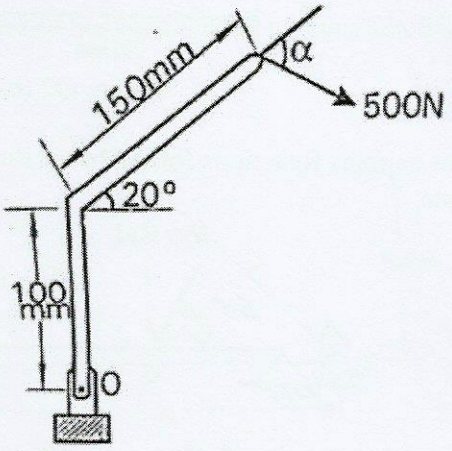


Figure Q1 (a)

b) Locate the Centroid for the Plane lamina shown in Figure Q1 (b) with respect to 'A' **(12)**

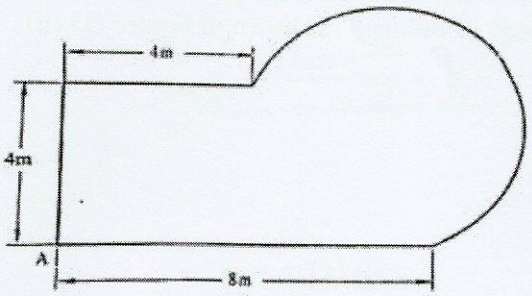


Figure Q1 (b)

2. a) State the Principle of Transmissibility of forces, Also explain the principle with the help of an example. **(04)**

b) For the plane lamina shown in Figure Q2 (b). Calculate the Moment of Inertia of the about Centroidal XX axis and Centroidal YY axis. **(16)**

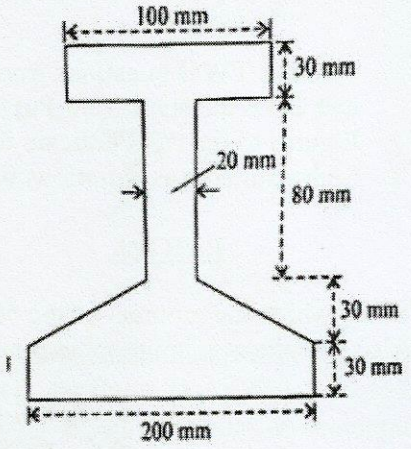


Figure Q2 (b)

3. a) Determine the support Reactions for the beam shown in the Figure Q3 (a) using Virtual work Principle. **(10)**

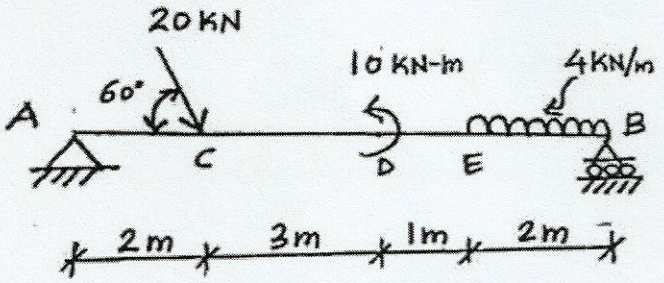


Figure Q3 (a)

b) Determine the Resultant in Magnitude, direction and point of application of four forces tangent to the circle of radius 3 m shown in Figure Q3 (b) **(10)**

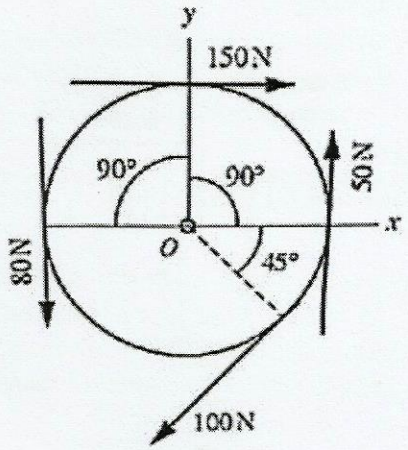
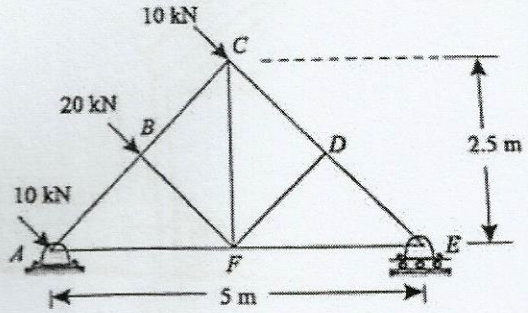


Figure Q3 (b)

PART-B

4. a) Find the forces in all the members of the truss loaded as shown in Figure Q4 (a) **(10)**



BF & DF are at the ⊥ angle

Figure Q4 (a)

b) Find the least value of 'P' that will start the system of blocks shown in Figure Q4 (b) to move rightwards. The coefficient of friction for all contact surfaces is 0.3; assume the pulleys to be frictionless **(10)**

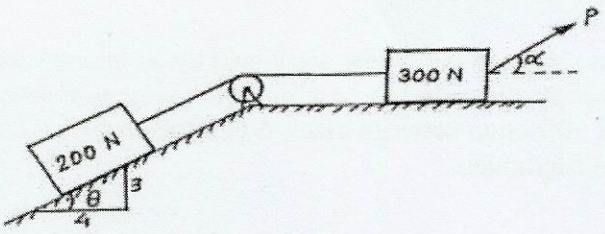


Figure Q4 (b)

5. a) Figure below shows a simple lifting machine. Identify the machine and derive an expression for its velocity ratio. [Fig Q5a] **(10)**

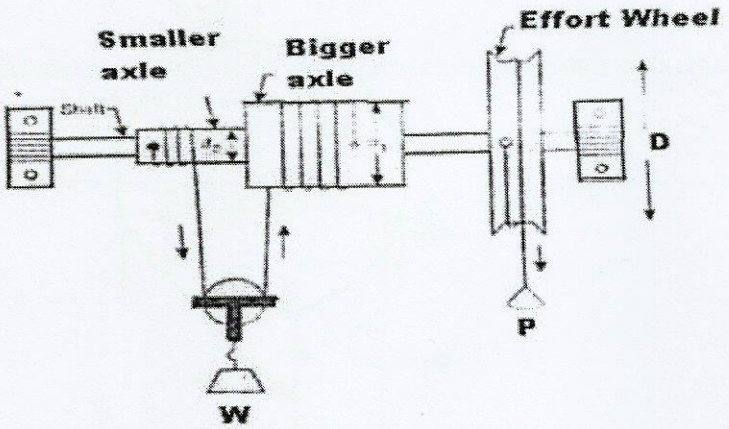


Fig Q5a

b) Two blocks connected by a string are pulled across a horizontal surface by a force applied to one of the blocks as shown in the figure [Fig Q5b]. The coefficient of friction between the blocks and the surface is 0.26. If each block has an acceleration of $3m/s^2$ to the right, what is the magnitude of the applied force **F**. **(10)**

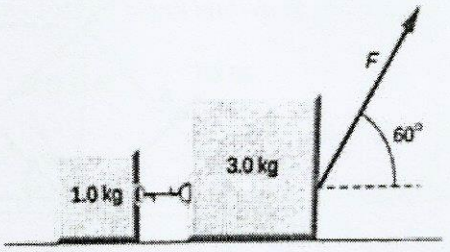


Fig Q5b

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 and that of the load drum is 300 mm and 150 mm respectively. Calculate the velocity ratio. If the machine is 50%, determine the effort required to lift a load of 300 N. **(10)**

b) Two blocks as shown in the Figure are joined by an inextensible cable. Determine the velocity of block A after it has moved 3m, if the system in released from rest. Assume that the coefficient of friction between block A and the plane is 0.25 and that the pulley is weightless and frictionless. **(10)**

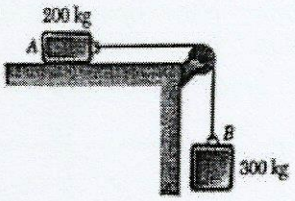


Fig Q6 b

PART-C

7. a) The system shown in figure Q7a has a rightward velocity of 4 m/sec A force P is applied to the 200N block as shown, Determine the value of "P" that will give a leftward velocity of 6 m/sec in a time interval of 30 sec. Take coefficient of friction is 0.20. Use Impulse Momentum Principle. **(10)**

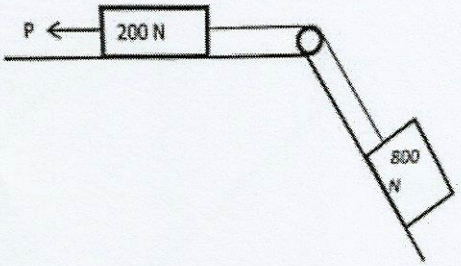


Fig Q7 a

b) A uniform beam has a mass of 18kg and rests on two surfaces at points A and B. Determine the maximum distance x to which the girl can slowly walk up the beam before it begins to slip. The girl has a mass of 50kg and walk up the beam with a constant velocity. Take coefficient of friction between contact surfaces as 0.2. [fig Q7 b] **(10)**

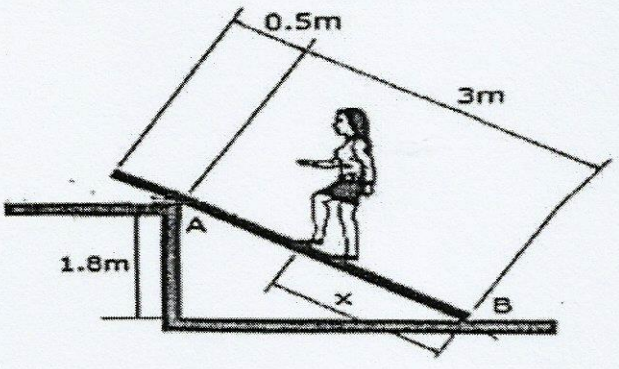


Fig Q7 b

8. a) For a pin jointed truss shown in the figure (Fig Q 8a), determine the magnitude and nature of forces in the members BC, GC and GF. **(10)**

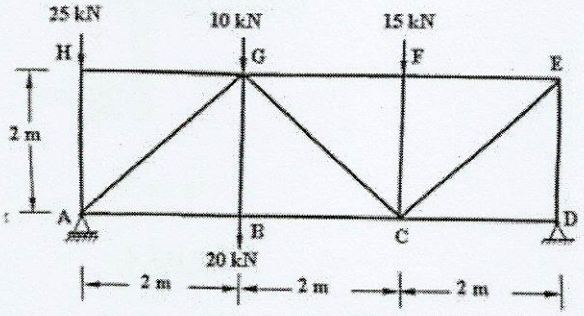


Fig Q8 a

b) Determine the centroid of the hatched area shown in Figure [Fig Q8b]. If the thickness of the lamina varies non-uniformily, then where is the centre of gravity expected? **(10)**

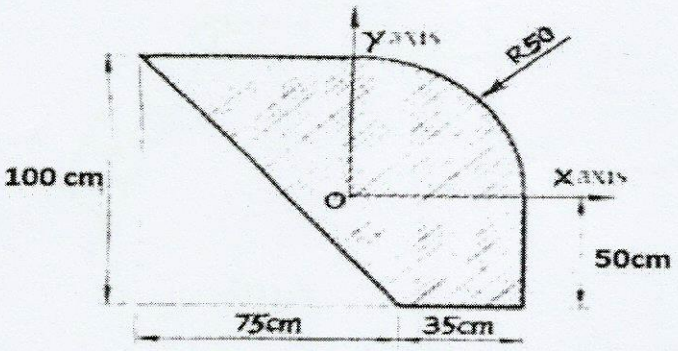


Fig Q8 b