Printed Pages : 7

EAG202

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 180214

Roll No.

B. Tech.

(SEM. II) THEORY EXAMINATION, 2014-15

ENGINEERING MECHANICS

Time : **3** Hours] [Total Marks : **100**

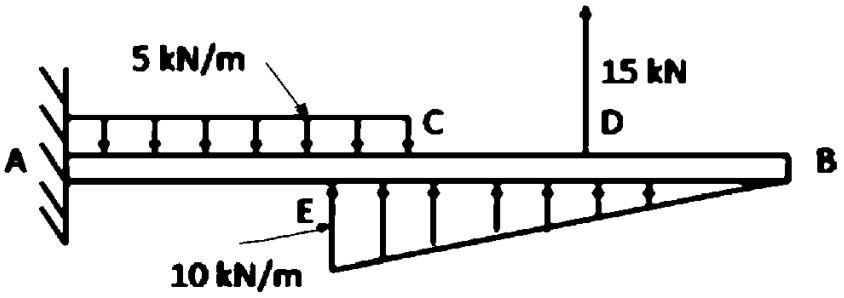
Note : (i) Attempt all questions.

(ii) All questions carry equal marks.

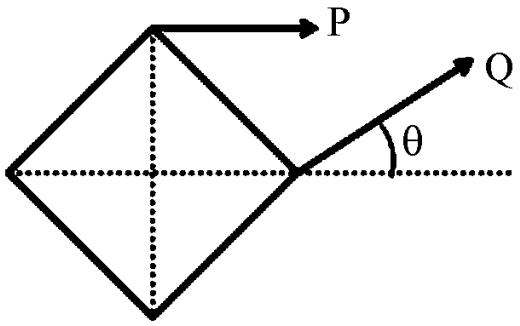
(iii) Assume missing data suitably, if any.

1 Answer any two parts of the following. **10×2=20**

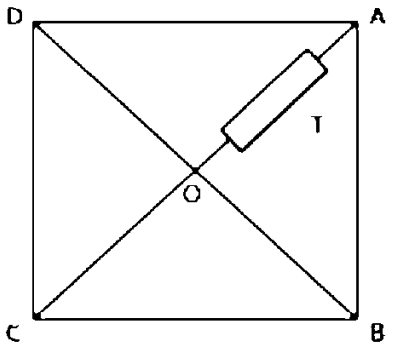
(a) Draw the free body diagram and determine the reaction components of the loaded beam shown in figure. Take span AB = 2.5 m, AC = 1.5 m, CD = 0.5 m and EB = 1.5 m.



(b) Describe Varignon's theorem for a coplanar concurrent force system. Two forces P and Q are applied to the corners of a 100 mm^2 square plate as shown in figure. Find forces P, Q and angle θ if resultant of two forces has a magnitude of 140 N, passing through the centroid of the plate and making an angle of 30° with positive x-axis.

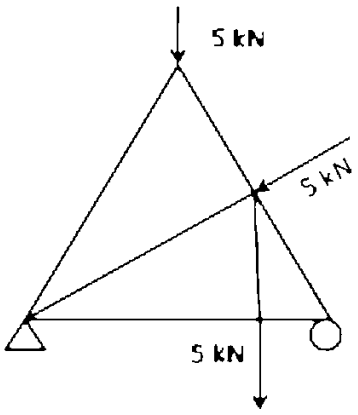


(c) A tensile force of T = 800 N is produced using a turnbuckle in one of the radial bars of regular square in which all joints are hinged, shown in figure. Determine the forces produced in all other bars.

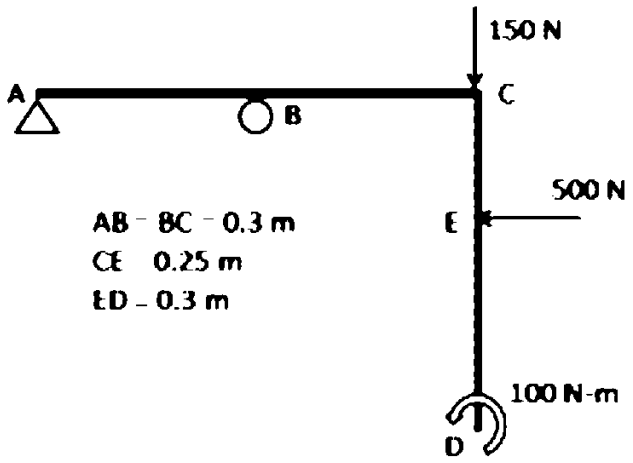


2 Answer any two parts of the following. **10×2=20**

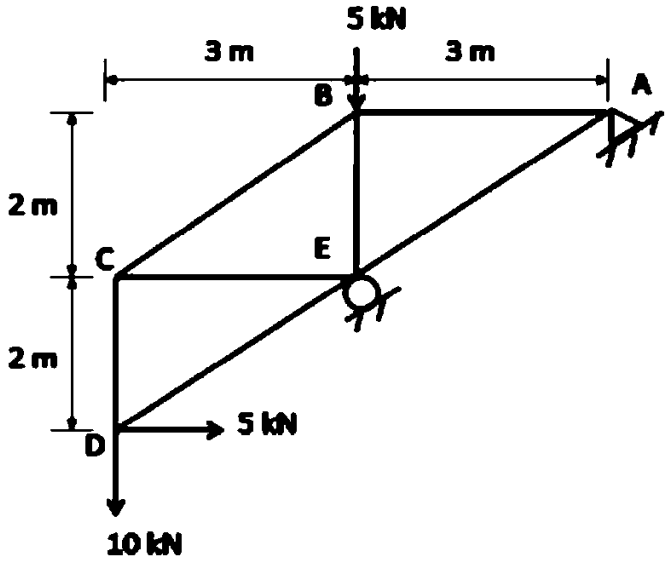
(a) Determine forces in all the members of truss shown in figure. The size of the each arm of the triangular truss is 2 m.



(b) An angle bracket is supported on a hinge and a roller support as shown in figure. Draw the free body diagram of the system and calculate the reactions at A and B.

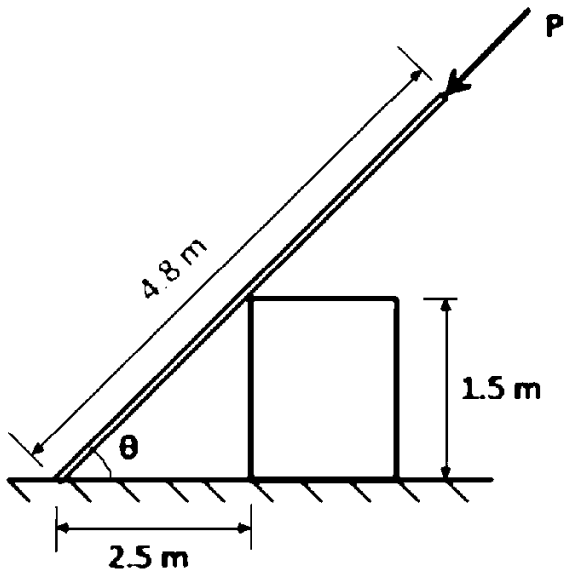


(c) For the overhanging truss shown in figure, determine the forces in members BC, CE and DE.



3 Answer any two parts of the following. **10×2=20**

(a) Determine the force P required to move the uniform 800 N plank from its position of rest as shown in figure, if the coefficient of friction at both contact location is 0.4.

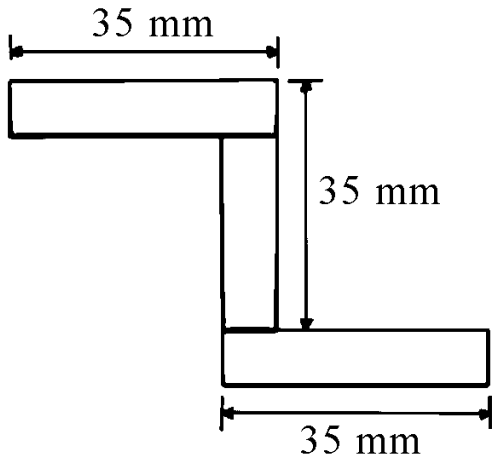


(b) A screw jack has square thread of mean diameter of 100 mm and a pitch of 12.5 mm. Determine the force that must be applied to the end of 500 mm lever (i) to raise (ii) to lower a load of 60 kN. Also, find the efficiency of the jack and state whether it is self locking.

(c) Discuss the reversibility of machines and self locking machines. If a machine whose velocity ration is 6 and an effort of 20 N is able to lift a load of 200 N. Determine (i) mechanical advantage of the machine, (ii) efficiency of the machine and (iii) effort lost in friction.

4 Answer any two parts of the following. **10×2=20**

(a) Find area moment of inertia of the z section about centroidal axes. The thickness of each section is 5 mm.

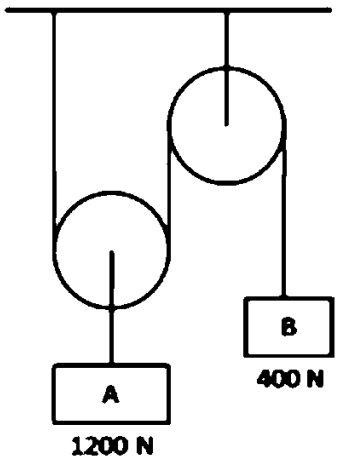


(b) A car starts from rest on a curved road of 200 m radius and accelerates at a constant angular acceleration of 0.5 m/s². Determine the distance and time which the car will travel before the total acceleration attained by it becomes 0.75 m/s².

(c) The acceleration of a particle is defined by the relation $a = 21 - 12s^2$, where a is acceleration in m/s² and s is in meters. The particle sarts with s = 0. Determine (i) velocity of the particle when s = 1.5 m, (ii) the position where the velocity is again zero, and (iii) the position where the velocity is maximum.

5 Answer any two parts of the following. **10×2=20**

(a) Determine the tension in the string and acceleration of the blocks A and B connected by a string as shown in figure. Assume pulleys are weightless and friction less.



(b) Explain the law of work and energy and the law of conservation of energy. A wagon weighing 100 kN moving at 18 kmph strikes a pair of buffer springs. If the stiffness of each spring is 600 kN/m, determine the maximum compression of the spring before the wagon comes to rest.

(c) Explain the following:

(i) Momentum and principle of conservation of momentum

(ii) Principle of virtual work

(iii) D'Alembert's principle.
