Printed Pages : 8

ME-101/ME-201

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

PAPER ID : 199218

Roll No. | | | | | | | | | | |

B. Tech.

(SEM. II) THEORY EXAMINATION, 2014-15

ENGINEERING MECHANICS

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

Note : Attempt all questions.

SECTION - A

1. Answer all questions. **[10x2=20]**

a. What is equilibrium? State the necessary and sufficient conditions for a system of coplanar forces to be in equilibrium.

b. State Varignon's theorem and its importance in finding the resultant of a coplanar force system.

c. Define point of contra flexure. In what type of beams this point occurs?

d. What is a deficient and redundant truss?

e. What is the difference between centroid and center of gravity?

f. Explain the concept of dynamic equilibrium?

g. Differentiate between kinematics and kinetics.

h. Discuss the assumption made in analysis of truss.

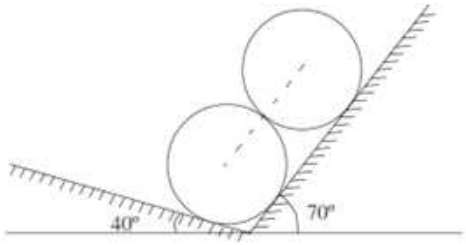
i. For a thin disc of mass m, the polar moment of inertia about an axis passing through its center and normal to the plane of disc is given as $\pi r^2/2$. Determine its mass moment of inertia about the same axis.

j. Define virtual work.

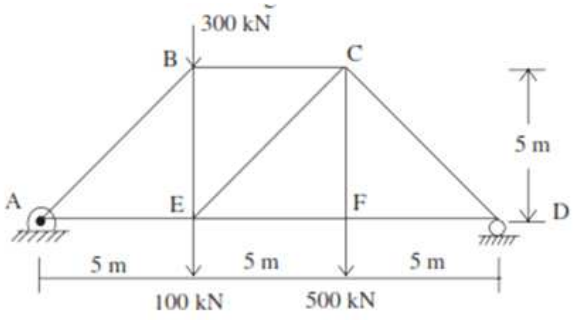
SECTION - B

2. Attempt any three of the following: **[10x3=30]**

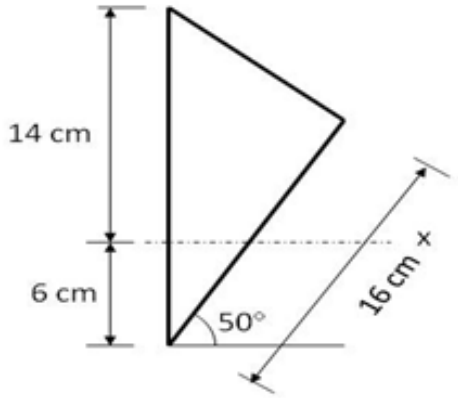
a. Two identical rollers each of weight 5000 N rest on smooth inclined planes as shown in figure. Find the Reactions of the planes on rollers.



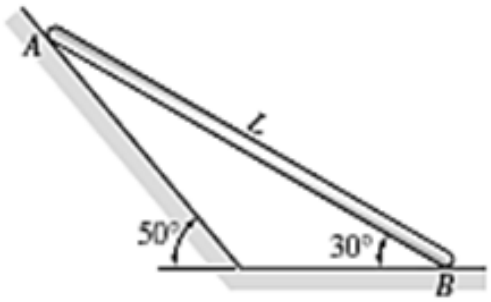
b. Determine the forces in members of the truss shown in figure. State if the members are in tension or compression.



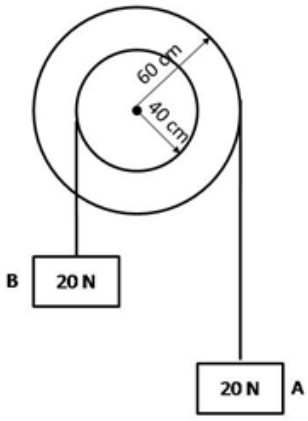
c. Determine the centroid of a wire bent in shape of a triangle as shown in figure about the given x axis.



d. When bar AB is in the position shown, end B is sliding to the right with a velocity 0.8 m/s. If length of the bar is 2 m, determine the velocity of end A in this position.



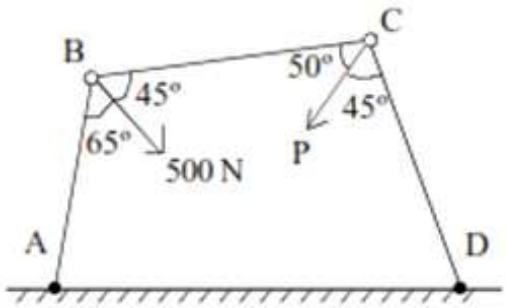
e. Two weights, each of 20 N, are suspended from a two-step pulley as shown in figure. Find the acceleration of the weight A and B using D'Alembert's principle. The weight of the pulley is 200 N and its radius of gyration is 200 mm.



SECTION - C

3. Attempt any one of the following: **[10x1=10]**

a. Three bars hinged at A and D and pinned at B and C as shown in figure form a four linked mechanism. Determine the value of p that will prevent movement of bars.



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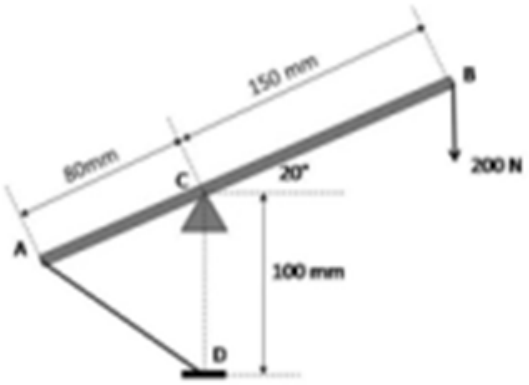
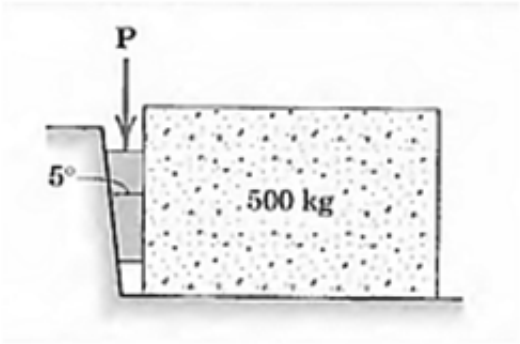
b. A lever AB is hinged at C and attached to a control cable at A as shown in figure. Determine (i) tension in the cable and (ii) the reaction at hinge C.

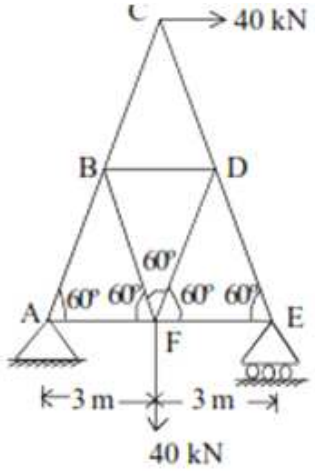


4. Attempt any one of the following: **[10x1=10]**

a. The horizontal position of 5000 N rectangular block of concrete is adjusted by a 5° wedge under the action of force P. If the coefficient of static friction for both surfaces of wedge is 0.3 and for the block and the horizontal surface is 0.6. Determine the least force required to move the block.

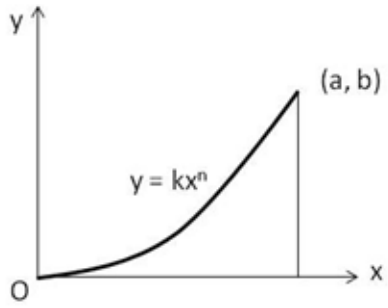


b. Determine the forces in all the members of the following truss given in figure.



5. Attempt any one of the following: **[10x1=10]**

a. Determine the centroid of the area given under the curve shown in figure.

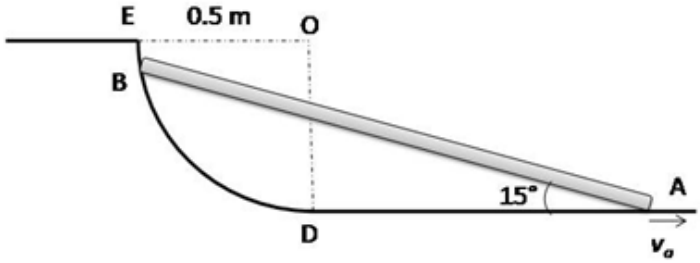


b. Determine the mass moment of inertia of a right circular cylinder about its centroidal axes.

6. Attempt any one of the following: **[10x1=10]**

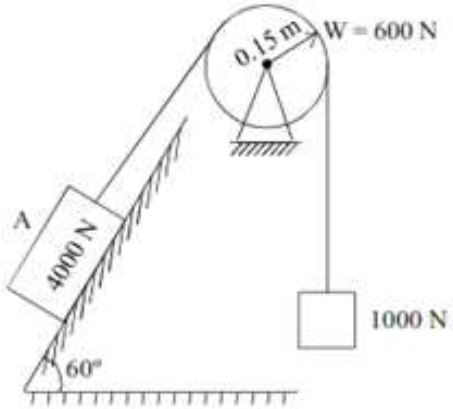
a. The acceleration of a particle is given by the expression $a = -kx^2$. The particle starts from zero initial velocity at x = 1 m and it is observed that its velocity is 5 m/s when x = 0.5 m. Find the value of k and the velocity of particle when x = 0.25 m.

b. Bar AB shown in figure is 1 meter long. End A moves with a velocity of 5 m/s on horizontal plane. End B follows a quarter circle path ED of radius 0.5 m. Find velocity of B for the given position.



7. Attempt any one of the following: **[10x1=10]**

a. Determine the distance that block A shown in figure must move in order to reach velocity of 3 m/s. What is the acceleration of the system? Take coefficient of friction between the block and plane as 0.2. Use work energy method.



b. A 50 kg block kept on top of a 15° slopping surface is pushed down the plane with an initial velocity of 20 m/s. if coefficient of kinetic friction is 0.4, determine the distance travelled by the block and the time it will take as it comes to rest.