PES UNIVERSITY

PES University, Bangalore
(Established under Karnataka Act 16 of 2013)

UE17CV101

END SEMESTER ASSESSMENT (ESA) B. Tech., I SEMESTER – Dec' 17

UE17CV101 – Engineering Mechanics

Time: 3 Hrs | Answer All Questions | Max Marks: 100

1.a.	Explain the terms a) Free Vector b) Sliding Vector c) Fixed Vector	06
1.b.	At what angle Θ must the 400-N force be applied as shown in figure 1.b. in order that the resultant R of the two forces has magnitude of 1000N?	04
1.c.	Compute the moment of the 1.6 N force about the pivot O of the wall-switch toggle as shown in figure 1.c.	05
1.d.	As a part of a design test, the camshaft-drive sprocket is fixed and then the two forces shown in figure 1.d. are applied to a length of belt wrapped around the sprocket. Find the moment at O and the magnitude of the resultant R.	05

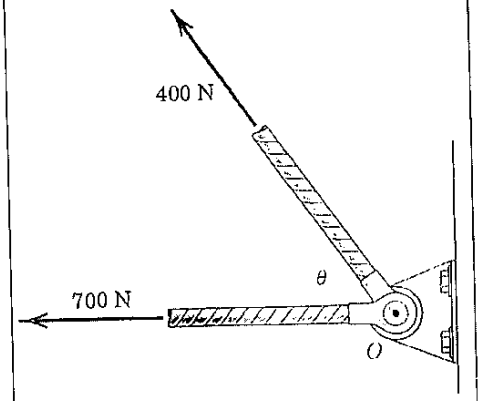

Figure 1.b.

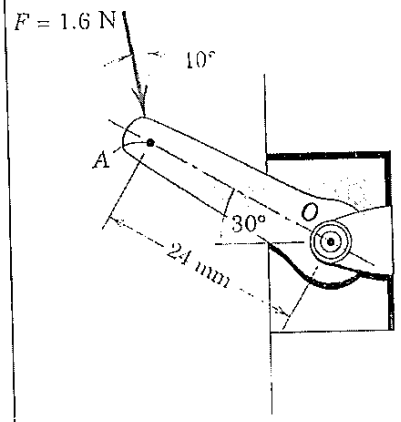

Figure 1.c.

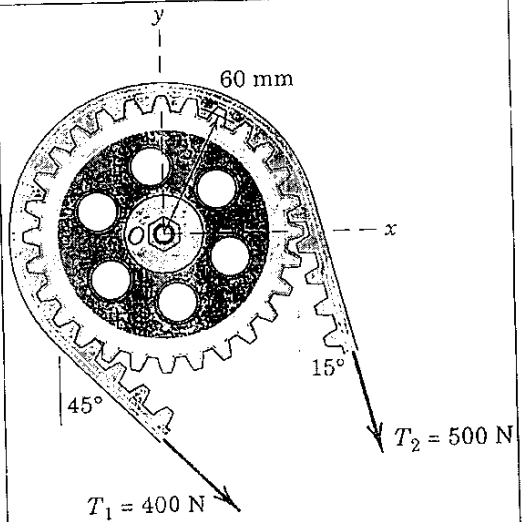

Figure 1.d.

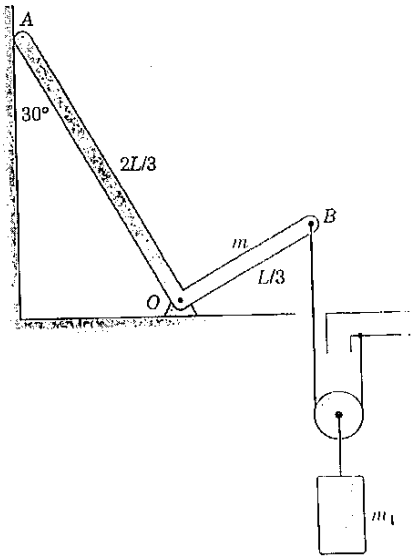

Figure 2.b.

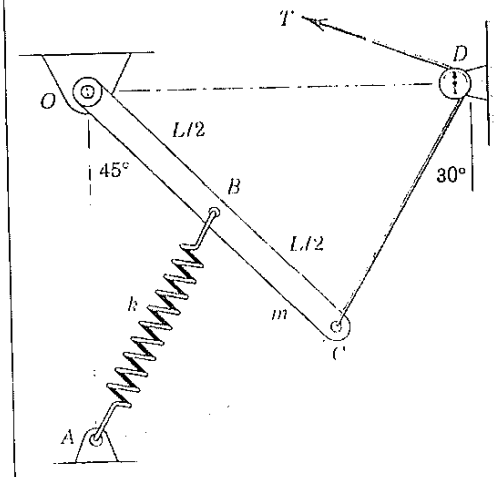

Figure 2.c.

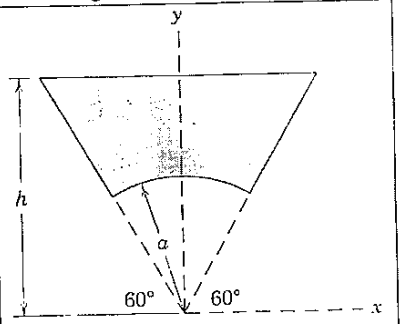

Figure 3.b.

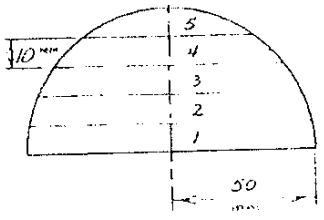

Figure 3.c.

2.a.	What do you understand by the terms 'Roller Support', 'Hinge Support', and 'Fixed Support?	04
2.b.	Determine the minimum cylinder mass m_1 required to cause loss of contact at A for the system as shown in figure 2.b.	08
2.c.	The uniform bar OC of length L pivots freely about a horizontal axis through O as shown in figure 2.c. If a spring of modulus k is unstretched when C is coincident with A, determine the tension T required to hold the bar in the 45^0 position. The diameter of the small pulley at D is negligible.	08
3.a.	Derive an expression to determine the Centroid of "area of a circular sector".	04
3.b.	Determine the y-coordinate of the centroid of the shaded area as shown in figure 3.b.	08
3.c.	Approximate the moments of inertia about the base (x- axis) of the semicircular area by dividing it into five horizontal strips of equal width as shown in figure 3.c. Treat the moment of inertia of each strip as its area (width times length of its horizontal midline) times the square of the distance from its midline to the x-axis (Base diameter). Compare your result with the exact value.	08

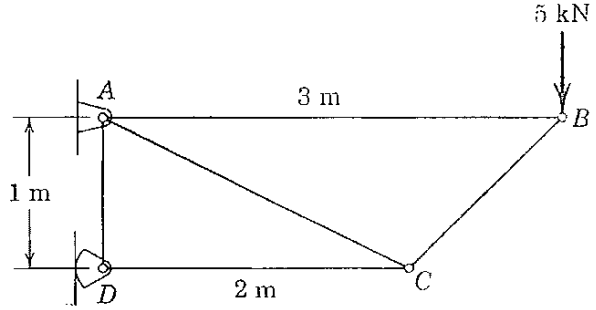

Figure 4.b.

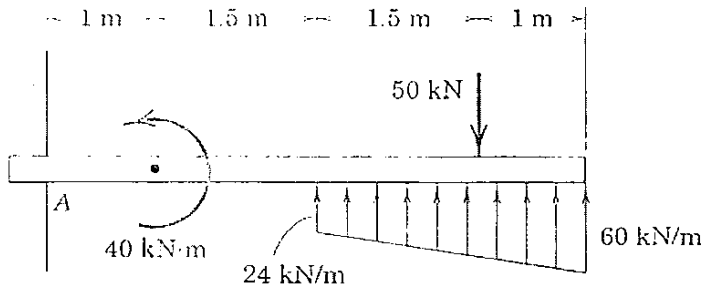

Figure 4.c.

4.a.	Explain any two different types of loadings on a beam with neat sketch.	04
4.b.	Determine the force in each member of the truss as shown in figure 4.b. Note the presence of any zero-force members.	08
4.c.	Determine the force and moment reactions at A for the beam which is subjected to the load combination as shown in figure 4.c.	08
5.a.	Explain the terms Coefficient of static friction and Coefficient of kinetic friction	04
5.b.	A loaded wheelbarrow is placed on a rough incline as shown in figure 5.b. The combined weight of the wheelbarrow and its load acts at the center of gravity G. Determine the maximum angle Θ for which the wheelbarrow will not slip.	08
5.c.	A counter clockwise moment M = 150 N-m is applied to the flywheel as shown in figure 5.c. If the coefficient of friction between the band and the wheel is 0.20, compute the minimum force P necessary to prevent the wheel from rotating.	08

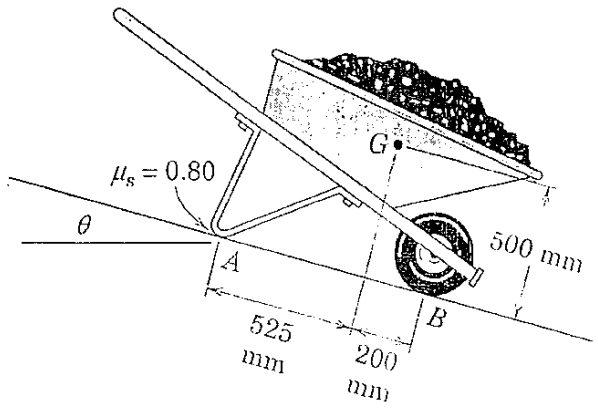

Figure 5.b.

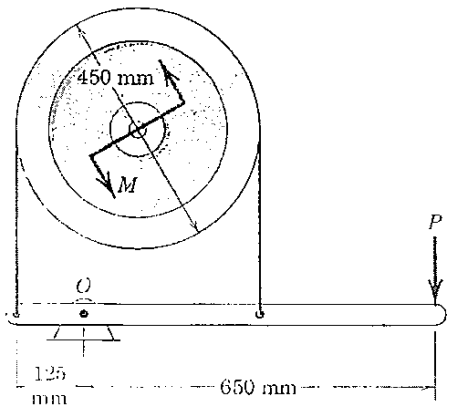

Figure 5.c.