PES UNIVERSITY

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

UE16CV101

END SEMESTER ASSESSMENT (ESA) B. Tech., II SEMESTER – May' 17
UE16CV101 – Engineering Mechanics

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

1.a.	Define Force and State its Characteristics.	04
1.b.	Determine the resultant R of the two forces applied to the bracket shown in figure 1.b. Write R in terms of unit vectors along the x- and y- axes.	05
1.c.	During a steady right turn, a person exerts the forces shown in figure 1.c on the steering wheel. Note that each force consists of a tangential component and a radially-inward component. Determine the moment exerted about the steering column at O.	04
1.d.	Determine the resultant R of the three forces acting on the simple truss shown in figure 1.d. Specify the points on the x- axis or y- axis through which R must pass.	07

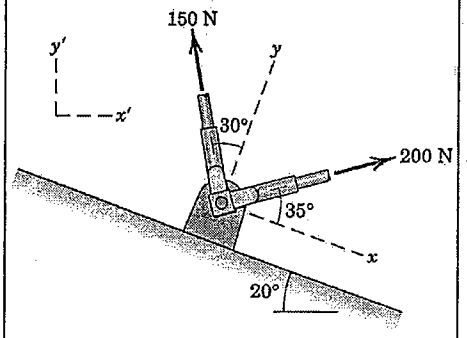

Figure 1.b.

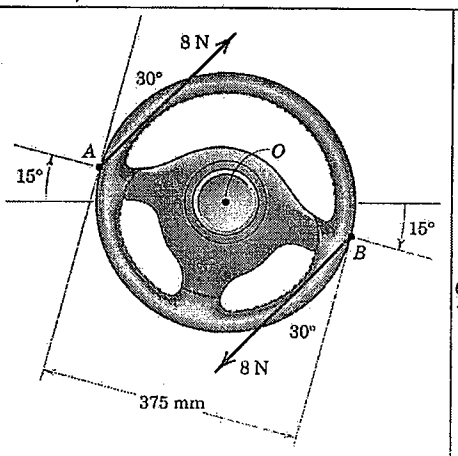

Figure 1.c.

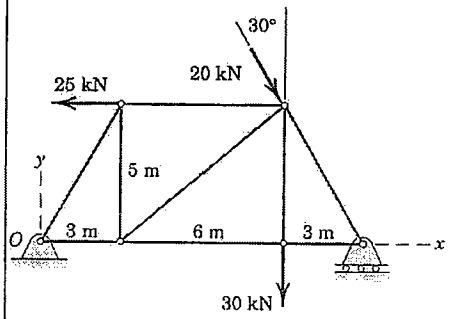

Figure 1.d.

2.a.	Define the term Equilibrium. State the independent equations required for parallel force system.	04
2.b.	The 500-kg uniform beam is subjected to the three external loads shown if figure 2.b. Compute the reactions at the support point O. The x-y plane is vertical.	08
2.c.	The two light pulleys are fastened together and form an integral unit. They are prevented from turning about their bearing at O by a cable wound securely around the smaller pulley and fastened to point A as shown in figure 2.c. calculate the magnitude R of the force supported by the bearing O for the applied 2-kN load.	08

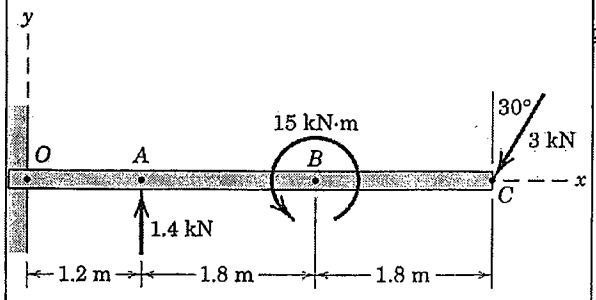

Figure 2.b.

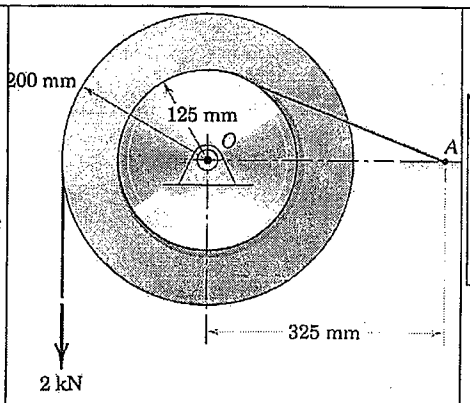

Figure 2.c.

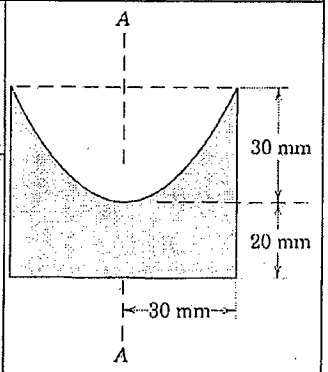

Figure 3.b.

3.a.	State and prove the parallel axis theorem.	04
3.b.	The figure 3.b shown represents a flat piece of sheet metal symmetrical about axis A-A and having a parabolic upper boundary. Choose your own coordinates and calculate the distance from the base to the centroid along the vertical.	08
3.c.	Determine the moments of inertia of the shaded area about the x- and y- axes.	08

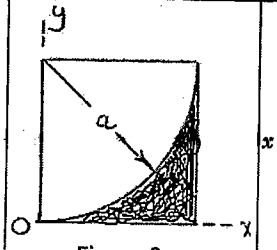

Figure 3.c.

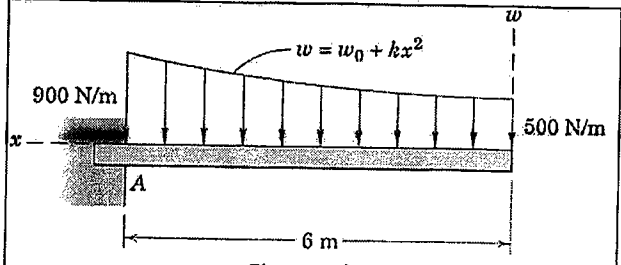

Figure 4.b.

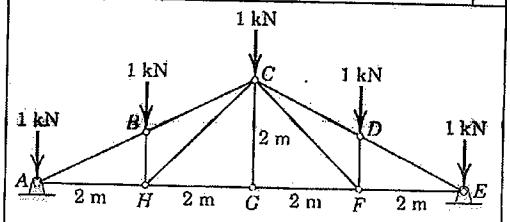

Figure 4.c.

4.a.	What do you understand by m+3=2j? What are the implications if this equation is not satisfied?	04
4.b.	A cantilever beam supports the variable load shown in figure 4.b. Calculate the supporting force R_A and moment M_A at A.	08
4.c.	A snow load transfers the forces shown in figure 4.c. to the upper joint of a Pratt roof truss. Neglect any horizontal reactions at the supports and solve for the forces in all members.	08
5.a.	Explain the terms Angle of repose with a neat sketch.	04
5.b.	The homogeneous body with two small feet and two ideal wheels is at rest on the rough incline as shown in figure 5.b. (a) Assume no slippage and determine the maximum value of the angle Θ for which the body does not overturn about feet A. (b) If $\mu_s = 0.4$, determine the maximum value of the angle Θ for which the body does not slip.	08
5.c.	A garden hose with a mass of 1.2 kg/m is in full contact with the ground from B to C as shown in figure 5.c. What is the horizontal component Px of the force which the gardener must exert in order to pull the hose around the small cylinder guard at B? The coefficient of friction between the hose and the ground is 0.50 and that between the hose and the cylinder is 0.40. Assume that the hose does not touch the ground between A and B.	04
5.d.	A force P = mg/6 is required to lower the cylinder at a constant slow speed with the cord making 1.25 turns around the fixed shaft as shown in figure 5.d. Calculate the coefficient of friction μ between the cord and the shaft.	04

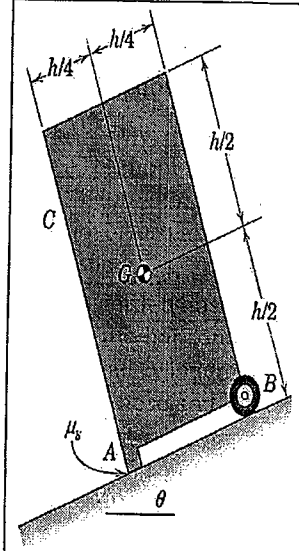

Figure 5.b.

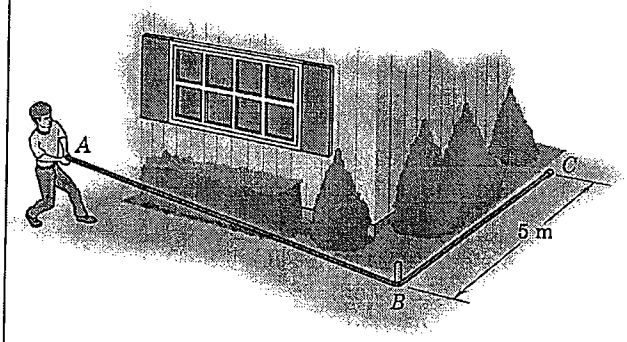

Figure 5.c.

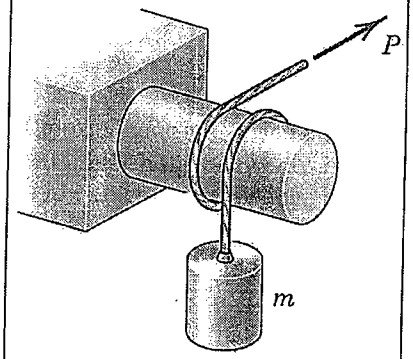

Figure 5.d.