Code No. : 12026 N/O (B)

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD
B.E. (CBCS) II-Semester Main & Backlog Examinations, May/June-2019
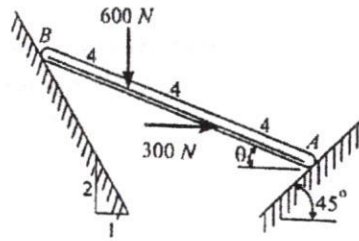### Basic Engineering Mechanics
(CSE, ECE & IT)

Time: 3 hours

Max. Marks: **60**

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** from **Part-B***

Q.No.	Stem of the question	M	L	CO	PO
	Part-A (10 × 2 = 20 Marks)				
1.	List the characteristics of a couple.	2	1	1	1
2.	Express the force vector of a 100kN force, passing from point A(2,4,1) to point B(6,7,8) and also write its unit vector.	2	1	1	1
3.	Define Free Body Diagram. Illustrate with an example.	2	1	2	1
4.	Three forces $\mathbf{F} = 10(2i +8j -6k)$, $\mathbf{P} = 20(-8i-2j+5k)$ and $\mathbf{T}$ acting on a body maintains its equilibrium. Find the magnitude and direction of missing force $\mathbf{T}$.	2	2	2	1
5.	What is a truss? Explain with suitable example how its indeterminacy can be determined.	2	1	3	1
6.	Describe the relationship between the number of joints and number of members in a perfect truss.	2	1	3	1
7.	State laws of friction.	2	1	4	1
8.	A body is on the point of sliding down an inclined plane under its own weight. If the inclination of the plane to the horizon is 30^0, what will be the angle of friction?	2	2	4	1
9.	State Parallel axis theorem and Perpendicular axes theorem.	2	1	5	1
10.	Define the terms Moment of Inertia and polar moment of Inertia.	2	1	5	2
	Part-B (5 × 8 = 40 Marks)				
11. a)	Three Force $\mathbf{F}, \mathbf{P}$ and $\mathbf{T}$ with Force multiplier F_m, P_m and T_m as 12 N/m, 20 N/m and 30 N/m starts from O(0,0,0) and pointed towards points A(1,2,3) , B(2,3,4) and C(-5,-2,-1) respectively. Find the Magnitude and direction of the Resultant Force $\mathbf{R}$.	4	3	1	2
b)	A flat plate is subjected to the coplanar system of forces shown in figure. Determine the resultant and its x & y intercepts.	4	2	1	2
12. a)	Two cylinders are piled in a rectangular ditch as shown in figure. Neglecting friction, determine the reactions at various contact points.	4	3	2	2

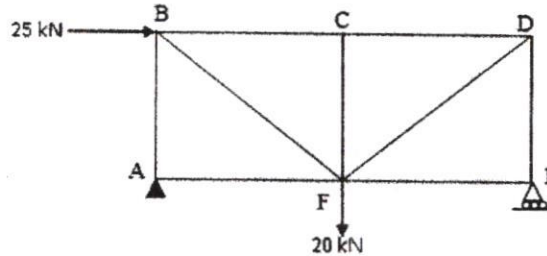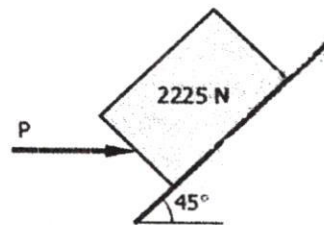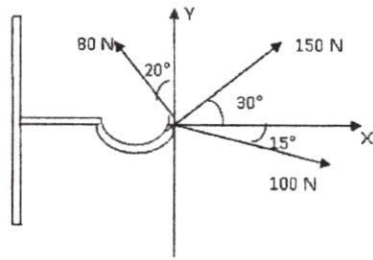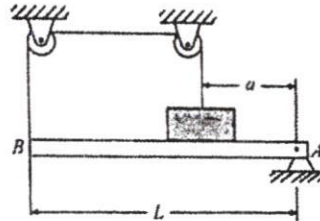|						
b)	A bar AB of negligible weight is subjected to a vertical force of 600 N and horizontal force of 300N applied as shown in figure. Find the angle Θ at which equilibrium exists. Assume smooth inclined surfaces.		4	2	2	2
13. a)	Differentiate between Method of joints and Method of sections.		2	2	3	1
b)	Analyse the pin jointed plane frame shown in the figure using the method of joints. All horizontal and vertical members are 4m in length.		6	3	3	2
14. a)	A uniform ladder weighing 20N of 10m length is placed against a smooth vertical wall with its lower end 4m away from the wall. The coefficient of friction between the ladder and the floor is 0.3. Check whether or not the ladder will be in equilibrium in this position.		2	2	4	2
b)	The 2225-N block shown in Fig. is in contact with 45° incline. The coefficient of static friction is 0.25.Compute the value of the horizontal force P necessary to, (a) just start the block up the incline , (b) just prevent motion down the incline. (c) If P = 1780 N, what is the amount and direction of the friction force?		6	4	4	2
15. a)	From the first principles, locate the centroid of a triangle.		2	2	5	1
b)	Find the moment of inertia about centroidal axes shown in the figure.		6	3	5	2
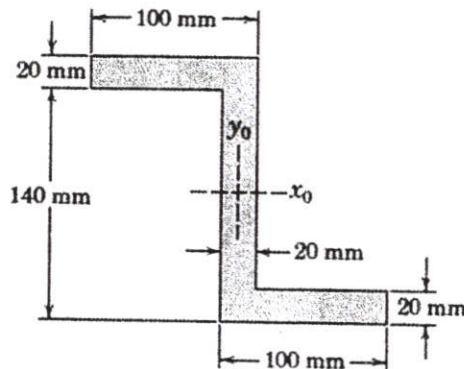
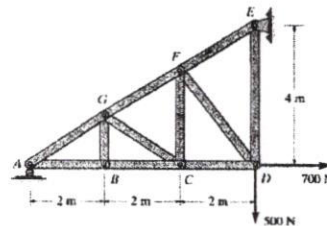| 16. a)	Find the resultant of the force system acting on the hook as shown in figure.	4	2	1	2

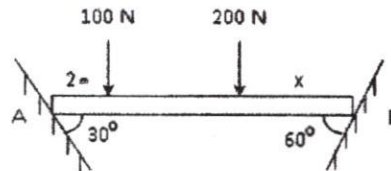| b)	A weight W rests on the bar AB as in figure. The cable connecting W and B passes over frictionless pulleys. If bar AB has negligible weight compute the reaction at A.	4	2	2	2

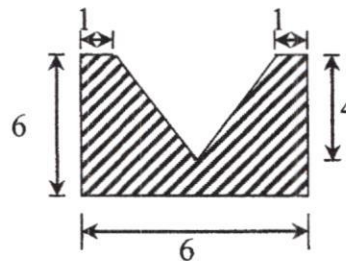| 17.	Answer any *two* of the following:				
a)	Find the zero member forces and analyse forces in rest of the members of the truss shown in the figure.	4	2	3	2

b)	A horizontal bar 10 m long and of negligible weight rests on rough inclined plane as shown in the figure. If the angle of friction is 15^0, how close to B may the 200N force be applied before motion impends.	4	3	4	2

c)	Determine the volume generated by rotating the shaded area about an axis through base. All dimensions are in cm.	4	4	5	2

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Programme Outcome

S. No.	Criteria for questions	Percentage
1	Fundamental knowledge (Level-1 & 2)	60
2	Knowledge on application and analysis (Level-3 & 4)	40
3	*Critical thinking and ability to design (Level-5 & 6) (*wherever applicable)	-

***