Code No. : 12615 N/O

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD
Accredited by NAAC with A++ Grade
B.E. II-Semester Main & Backlog Examinations, September-2022
Basic Engineering Mechanics
(I.T.)

Time: **3 hours**   Max. Marks: 60

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

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Two forces, each of magnitude 100N act at an angle of 60 degrees between them. **Compute** the magnitude and the orientation of the resultant.	2	1	1	1
2.	A force of 120N magnitude acts along the line from A(1,2,4) to B(3,6,9). **Compute** the unit vector along the given force.	2	1	1	1
3.	A force of 100N acts right-up at an inclination of 60 degrees at the point (3,4). **Compute** the moment of the force at the origin.	2	1	2	2
4.	**State** and **explain** Varignon's theorem.	2	1	2	1
5.	**State** the relationship between the number of joints *j* and number of members *m* of a redundant truss.	2	1	3	1
6.	A plane truss has 7 joints and 11 members. **State** if the given truss is deficit, perfect or redundant? Explain why.	2	1	3	2
7.	**Explain** what is meant by limiting friction and point of impending motion?	2	1	4	1
8.	A body of 300N resting on a rough horizontal plane is pushed by a force of 40N to the right. The coefficient of friction is 0.2. **Compute** the magnitude and direction of the friction force exerted.	2	1	4	2
9.	A semicircular area of radius r has X-axis as its axis of symmetry. **State** the coordinates of its centroid.	2	2	5	2
10.	**State** the location of centroid of a quarter circle of radius r located in the first quadrant.	2	2	5	1

Part-B (5 × 8 = 40 Marks)

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11. a)	A block is resting on an incline oriented at 4 units horizontal to 3 units vertical. The block is acted upon by a force F of magnitude 400N acting horizontally to the right. X axis is oriented along and up the incline while Y axis is normal to and away from the incline. **Compute** F_X and F_Y.		4	3	1	2
b)	**State** and **explain** Parallelogram law of forces. Two forces, each of magnitude P, are inclined at 60⁰ to each other. Their resultant is 433.0127 N. **Compute** P.		4	4	1	2

12.	a)	In the figure below, the moment of a certain force F is 312.5 Nm clockwise about O and 612.5 Nm clockwise about B. If its moment about A is zero, **compute** the force.	4	3	2	2
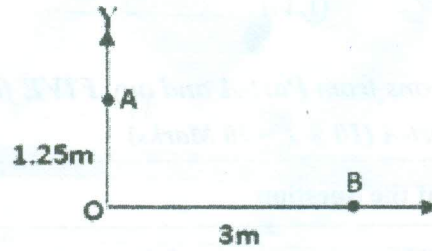
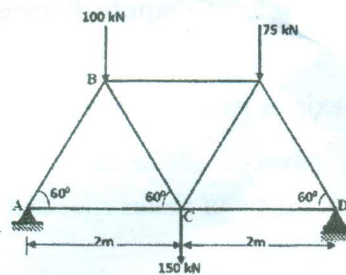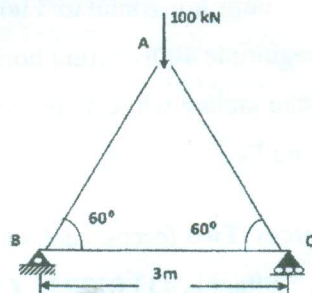|							
	b)	Three cylinders are piled in a rectangular ditch as shown in the figure. Neglecting friction, determine the reaction between cylinder A and the vertical wall. $W_A = 300N$; $W_B = 800N$; $W_C = 400N$	4	3	2	2
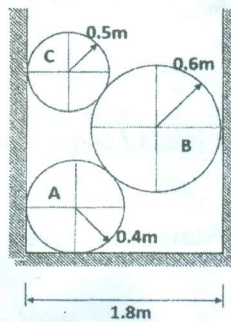
13.	a)	**Analyze** the plane truss shown in the figure using the method of joints	4	3	3	2

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	b)	**Analyze** the plane truss shown in the figure using the method of joints	4	3	3	2

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

100N   200N

A   B

30^0 10m 60^0

2m   x
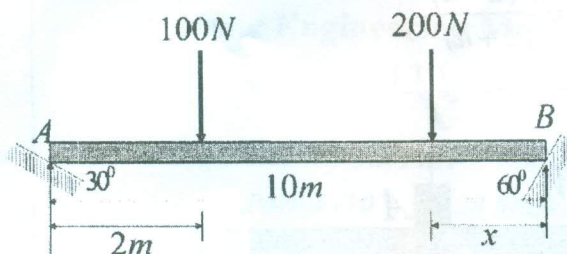
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	b)	Blocks A and B are joined by a cord parallel to the inclined plane as shown in the figure. Under block A which weighs 200N, μ=0.2 while μ=0.5 under block B which weighs 300N. **Determine** the angle θ at which motion impends. **Compute** is the tension in the cord.	4	3	4	2

Y   X

B

A

θ
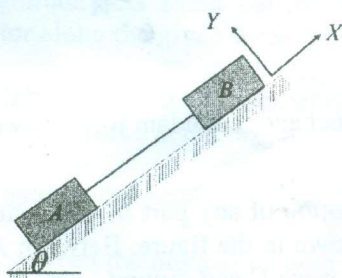
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15.	a)	**Compute** the centroid of a triangular lamina of base b and height h about the axis passing through to its base.	4	4	5	2
	b)	**Compute** the area moment of inertia of the area bounded by the curve about the X-axis as shown in the figure below:	4	2	5	2

Y

$y^2 = kx$

b

a

X
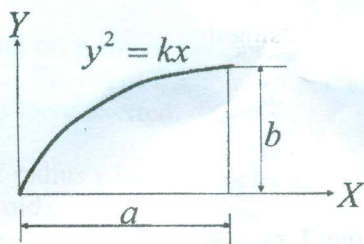
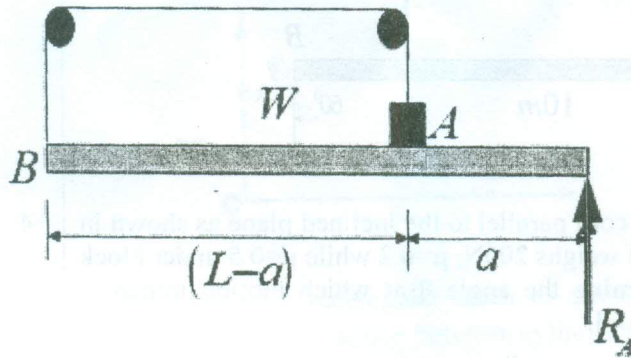|						
16.	a)	The force system shown in the figure has a resultant of 200N pointing up along the Y-axis. **Compute** the values of F and θ required to give this resultant.	4	4	1	2

Y

F

θ

500N 30^0 X

240N
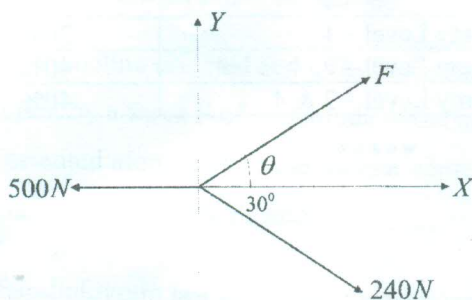
b)	A weight W rests on bar AB as shown in the figure. The cable connecting W and A passes over frictionless pulleys. If the bar AB has negligible weight, show that the reaction at A is $R_A = \dfrac{W(L-a)}{(L+a)}$	4	3	3	2

17. Answer any *two* of the following:

a)	**Explain** the difference between deficit, perfect and redundant trusses by citing relevant examples.	4	4	3	1
b)	**Find** the least horizontal force P to start motion of any part of the system of three blocks resting upon one another as shown in the figure. Between A and B, $\mu=0.3$; between B and C, $\mu=0.2$; and between C and ground , $\mu=0.1$	4	4	4	1

$W_A = 300\ N$

$W_B = 100\ N$

$W_C = 200\ N$
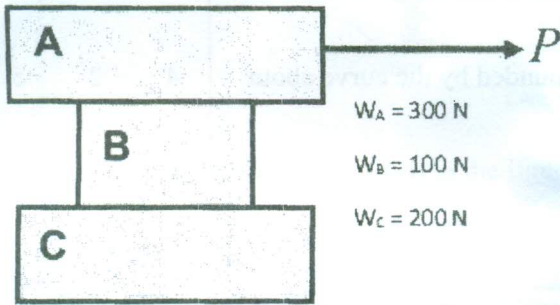
c)	**Compute** the area moment of inertia of the T-section with a flange width 300mm and depth 30 mm in addition to a web of width 25mm and depth 270mm, about its centroidal X and Y axes.	4	4	5	2

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

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	40%
iii)	Blooms Taxonomy Level – 3 & 4	40%

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