VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD
Accredited by NAAC with A++ Grade
B.E. (CBCS) II-Semester Main & Backlog Examinations, Aug/Sep-2021.

### Basic Engineering Mechanics
(Common to C.S.E., AIML & I.T.)

Time: 2 hours   Max. Marks: 60

Note: Answer any NINE questions from Part-A and any THREE from Part-B

Part-A (9 × 2 = 18 Marks)

Q. No.	Stem of the question	M	L	CO	PO
		2	1	1	1
1.	State Varignon's theorem	2	2	1	1
2.	Differentiate between moment and couple	2	1	2	1
3.	Define Equilibrant	2	1	2	1
4.	State Lami's theorem	2	1	3	1
5.	What is a perfect frame?	2	2	3	1
6.	When method of sections are preferred over method of joints?	2	1	4	1
7.	Define coefficient of friction and angle of friction	2	1	4	1
8.	Explain cone of friction with a neat sketch	2	2	5	1
9.	Determine the centroid of arc of a semicircle of radius 'R' $\left(\frac{2R}{\pi}, 0\right)$	2	2	5	1
10.	Find the radius of gyration of a circular section of radius 30mm $\frac{69}{}$	2	2	1	1
11.	Find the resultant of the two forces P= 2i + 3j and F= 4i-3j	2	1	2	1
12.	Explain free body diagram with a neat sketch			1	2

Part-B (3 × 14 = 42 Marks)

13. a) The magnitude of two forces P and Q when acting at right angles produces a resultant of 6N. When these two forces act at an angle of 60°, they produces a resultant of 7N. Calculate P and Q.   [M: 4, L: 2]

(handwritten) $P = 2.36 N$, $Q = 5.51 N$

b) Determine the position and magnitude of the resultant force system acting on the frame work shown below.   [M: 10, L: 3, CO: 1, PO: 1]

(handwritten) R= 282.59N   θ = 43°
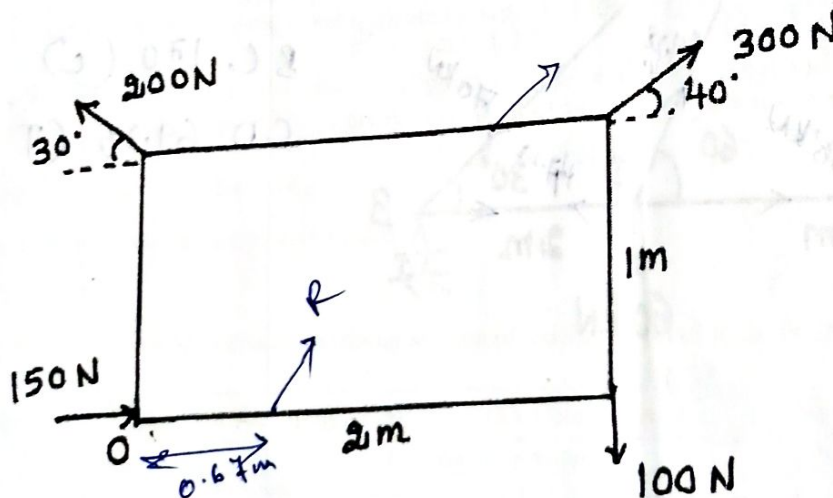
14. a) Write the equations of equilibrium in 2D and 3D.

b) Two cylinders of diameters 70mm and 50mm weighing 150N and 100N respectively are placed as shown below. Assuming all the contact surfaces to be smooth, find the reactions at A, B and C.

	4	1	2	1
	10	3	2	2

100 mm

34·16N

89·44

233·78N

100 N

150N

30°

B

R$_B$ 288·68W
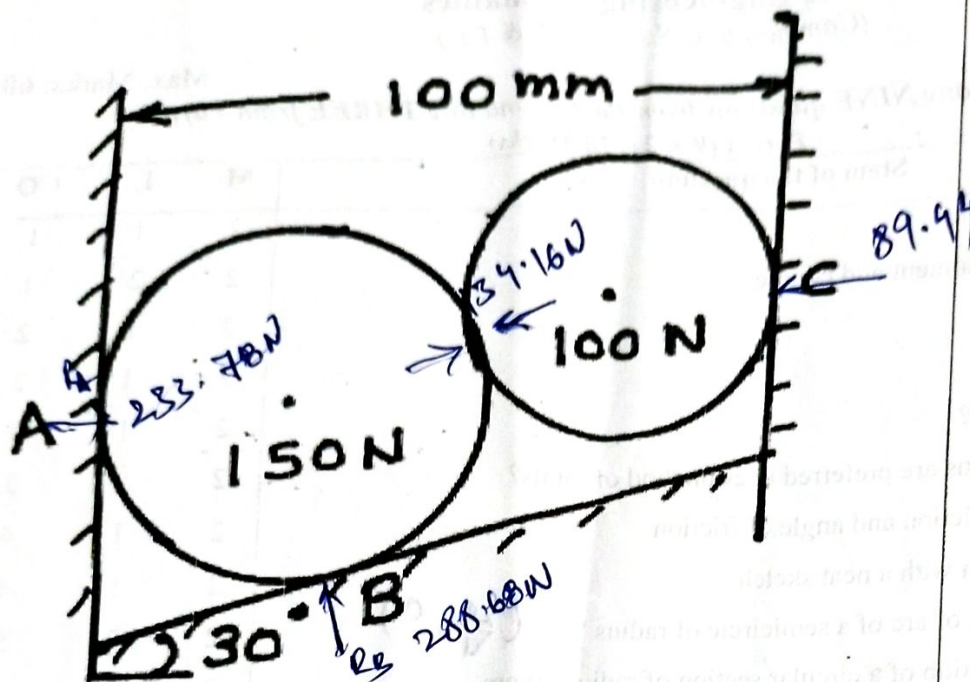
5. a) A simply supported truss carries point loads of 90kN and 60kN at joint 'C' and 'D' as shown in figure below. Find the forces in all the members of the truss using method of joints.

10	4	3	2

C ↓ 90 kN

130KN

89·28 kN

170KN

30°

112·58kN   60°   D 147·2 30°   B

4m   2m

60 kN
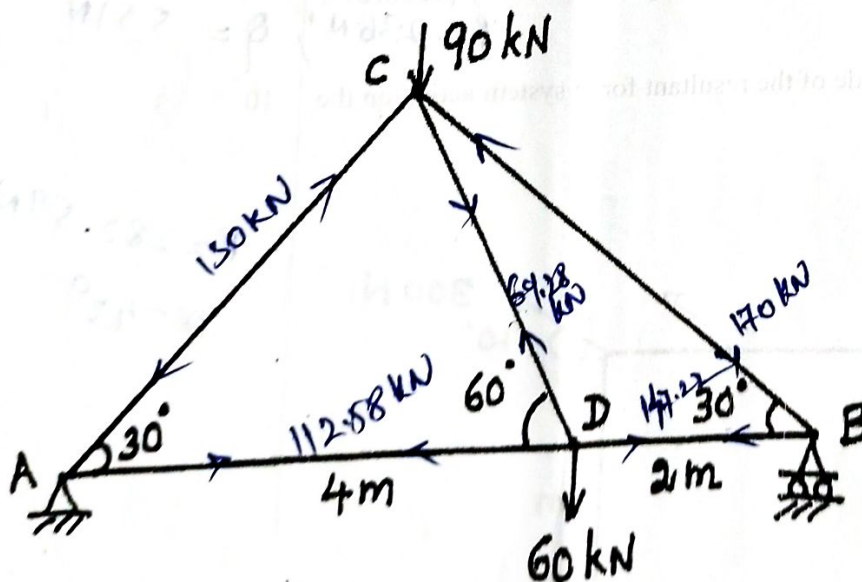
AC 130KN (C)
AD 112·58 (T)
DB 147·22 (C)
BC 170 (C)
CD 69·28 (T)

b) For the above truss, find the forces in BC and AD using method of sections.

4	4	3	2

Contd.. 3

			4	1
		4	1	2
		4	4	

a) Explain Belt friction in brief with a sketch.

b) Block 'A' weighing 1000N is to be raised by a 10° wedge 'B'. Taking angle of friction as 15°, determine the minimum horizontal force to be applied to raise the block as shown below.

(handwritten: 683.28N)
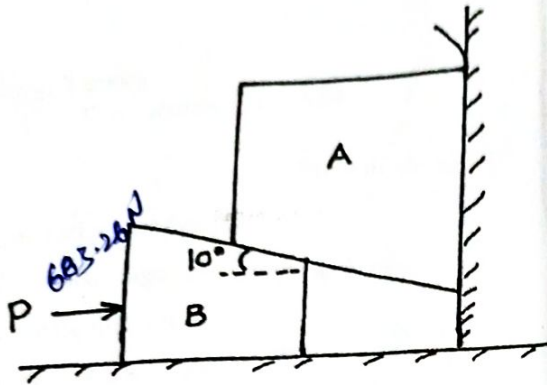
17. a) Determine the coordinates of centroid for the plane area as shown below. A semicircle of radius 20mm is removed from triangle.

8	3	5	2

(handwritten: $\bar{x} = 16.45\,mm$, $\bar{y} = 31.69\,mm$)
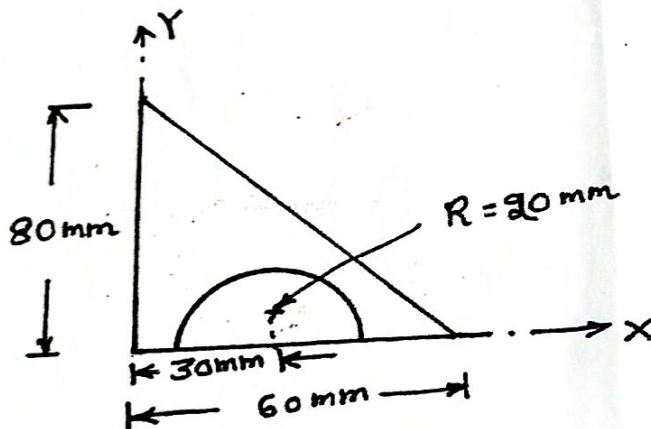
b) For the above figure, find the moment of inertia about horizontal base 'X' axis

(handwritten: $2.5 \times 10^6\,mm^4$)

6	2	5	2

18. a) Determine the resultant of the system of forces having the following magnitudes and passing through the origin and indicated points. P= 140N (3,-6,2), T=260N (-12,4,-3) and F= 90N (3,6,-6)

(handwritten: $R = 171.7\,N$, $-150i + 20j - 80k$)

8	3	1	2

b) Find the support reactions for a simply supported beam of span 6m subjected to point loads of 20kN and 40kN at a distance of 1m and 3m from the left support.

(handwritten: $R_A = 36.67\,kN$ & $R_B = 23.33\,kN$)

6	2	2	2

19. Answer any *two* of the following:

a) Assumptions made in analysis of trusses

7	1	3	1

b) Laws of friction

7	1	4	1

c) Determine moment of inertia of a circular section of radius 'R' about its centroidal axis

7	2	5	1

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)	52
2	Knowledge on application and analysis (Level-3 & 4)	48

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