Hall Ticket Number:

Code No. : 12628 N/O

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD
Accredited by NAAC with A++ Grade
B.E. II-Semester Main & Backlog Examinations, August-2023
### Basic Engineering Mechanics
(Common to IT O: CSE)

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.	State law of triangle of forces.	2	1	1	1
2.	A force of 100N is passing through points A (1,-2, 5) and B (3, 4, 7). Determine the value of the force multiplier.	2	2	1	2
3.	Write down the equilibrium equations which can be framed for a non-coplanar concurrent force system.	2	1	2	2
4.	State Lami's theorem.	2	1	2	2
5.	Write the relationship between total number of joints j, total number of members, m and total number of support reactions, r for a perfect truss.	2	1	3	3
6.	Write the equilibrium equations available while analyzing a truss using method of sections.	2	1	3	2
7.	Define angle of friction.	2	1	4	3
8.	What is the relationship between angle of friction and angle of inclination for a block of weight W which is on the brink of motion on a given inclined plane?	2	2	4	3
9.	Write the coordinates of centroid of a quarter circle of radius R with respect to base X and Y axes.	2	1	5	1
10.	Define area moment of inertia	2	1	5	1

Part-B (5×8 = 40 Marks)

11. a)	What is a couple? What is the difference between a couple and a moment?	4	2	1	1
b)	Determine the magnitude and direction of the resultant of the four forces shown in the figure-1 below.	4	3	1	2

FIG-1

|			3	2	2	1
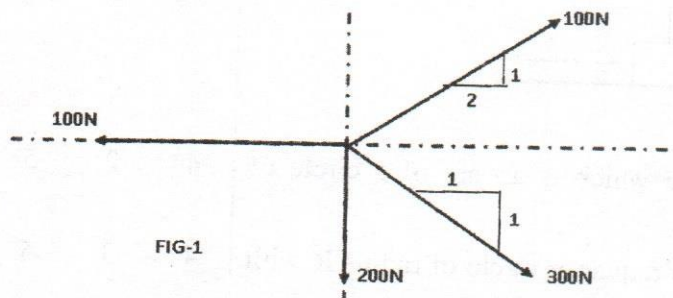
12. a) Write the equilibrium equations available for a coplanar non-concurrent force system.   3   2   2   1

b) Two rollers of the same diameter are supported by an inclined plane and a vertical wall as shown in figure-2 below. The upper and the lower rollers are respectively 200N and 250N in weight. Assuming smooth surfaces, find the reactions induced at the points of surfaces of contact   5   3   2   3


Fig-2

15°
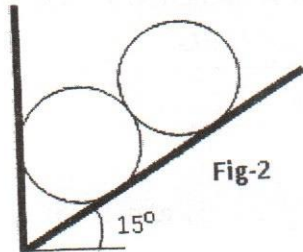
13. a) Write stepwise procedure adopted in analyzing a truss using method of joints.   4   2   3   2

b) Find the support reactions and forces in members BC, CD and DE using method of sections for the symmetrical truss shown in the figure-3 below,   4   3   3   3

FIG-3
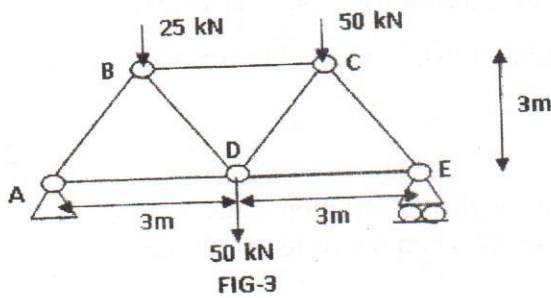
14. a) Define static friction and kinetic friction. What is the relationship between them?   3   2   4   2

b) A block R of mass 1000N is placed on a block S of mass 1500N as shown in the figure-4 below. Block R is tied to the wall by a mass less inextensible string PQ. If coefficient of static friction for all surfaces is 0.4, then determine the minimum force, F needed to move block S   5   3   4   3

FIG-4
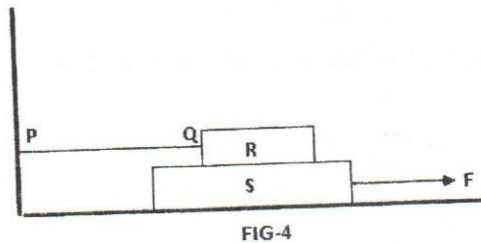
15. a) Derive the centroidal distance of a line which is an arc of a circle of radius R with included angle 2α.   4   2   5   2

b) Determine the area moment of inertia of a quarter circle of radius R with respect to its centroidal axis.   4   3   5   3

			M	L	CO	PO

16. a) State parallelogram law of forces and derive the necessary formula. — 4 2 1 1

b) A block of weight W is placed on a smooth inclined plane of 30° inclination. A horizontal force P is applied on the block to prevent its down plane motion. Determine the value of force P by drawing a neat free body diagram. — 4 3 2 2

17. Answer any *two* of the following:

a) Determine the forces in the members of the truss due to the applied load as shown in the figure-5 below. — 4 3 3 3

FIG-5
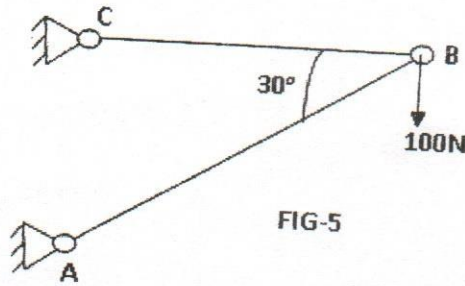
b) Bodies A and B are joined by a cord parallel to the inclined plane as shown in the figure-6 below. Under body A which weighs 200N, coefficient of friction is 0.2 while coefficient of friction is 0.5 under body B which weighs 300N. Determine the angle of inclination of the inclined plane at which motion impends. — 4 3 4 3

FIG-6
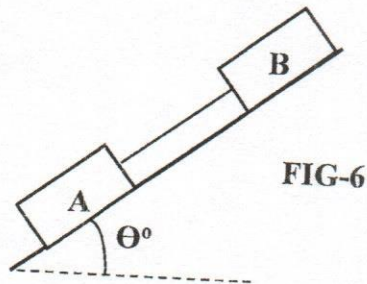
c) Derive the formula for the area moment of inertia of a rectangular section of breadth, b and depth, h from basic principles with respect to its own centroidal axis. — 4 2 5 2

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

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	37.5%
iii)	Blooms Taxonomy Level – 3 & 4	42.5%

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