SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN
(AUTONOMOUS)
(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai - 600 044.
B.Sc.Mathematics - END SEMESTER EXAMINATIONS - NOV'2024
SEMESTER - IV
20UMACT4008 - Statics

Total Duration : 2 Hrs.30 Mins.   Total Marks : 60

Section B

Answer any **SIX** questions $(6 \times 5 = 30$ Marks$)$

1. State the Laws of friction.

2. The magnitude of the resultant of two given forces P, Q is T. If Q is doubled, then R is doubled. If Q is reversed, then also R is doubled.
   Show that $P : Q : R = \sqrt{2} : \sqrt{3} : \sqrt{2}$.

3. The sides BC. CA, AB of a Δ ABC are bisected in D, E, F. Show that the forces represented by DA, EB, FC are in equilibrium.

4. Find the magnitude and direction of the resultant of three coplanar forces
   P, 2P, 3P acting at a point and inclined mutually at an angle of $120°$.

5. State and prove Lami's theorem.

6. I is the in centre of a triangle ABC. If forces of magnitude P, Q, R acting along the bisectors IA, IB, IC are in equilibrium,
   show that $\dfrac{P}{cosA/2} = \dfrac{Q}{cosB/2} = \dfrac{R}{cosC/2}$.

7. A particle rests on a plane inclined at $45°$ to the horizontal, being supported by a string along the line of the greatest slope. If the ratio of the maximum and minimum tensions consistent with equilibrium is 2 : 1, find the co-efficient of friction.

8. A rod of length '$5a$' is bent so as to form five sides of a regular hexagon.
   Show that its centre of mass is at a distance $a\sqrt{1.33}$ from either end of the rod.

Section C

Answer any **THREE** questions $(3 \times 10 = 30$ Marks$)$

9. Find the magnitude and direction of the resultant of $\vec{F_1}$ and $\vec{F_2}$.

10. E is the midpoint of the side CD of a square ABCD. Forces $16, 20, 4\sqrt{5}, 12\sqrt{2}$ act along $\overrightarrow{AB}, \overrightarrow{AD}, \overrightarrow{EA}, \overrightarrow{CA}$. Show that they are in equilibrium.

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11. Weights W, w, W are attached to the points B, C, D respectively of a light string AE where B, C, D divide the string into 4 equal lengths. If the string hangs in the form of four consecutive sides of a regular octagon with the ends A and E attached to points on the same level, show that $W = (\sqrt{2} + 1)w$.

12. Suppose a particle of mass m is placed on a rough inclined plane inclined at an angle α to the horizontal and a force of magnitude S acts on it in a direction making an angle θ with the plane. If the equilibrium is limiting, find S.

13. Find the mass centre of the following

   i. Thin wire in the form of a circular arc.

   ii. Lamina in the form of a sector of a circle.

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