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. Maths - END SEMESTER EXAMINATIONS APRIL - 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. (a) Define Linear Momentum
   (b) State Hook's Law
   (c) Define angle of friction.
2. The resultant of two forces P, Q is of magnitude P. Show that if P is doubled, the new resultant is perpendicular to the force Q and its magnitude is $\sqrt{4P^2 - Q^2}$.
3. Three forces acting at a point are parallel to the sides of a triangle *ABC*, taken in order, and in magnitude they are propotyional to the cosines of the opposite angles. Show that the magnitude of their resultant is proportional to $\sqrt{1 - 8cosAcosBcosC}$.
4. State and prove Lami's theorem.
5. G is the centroid of a triangle *ABC*. Forces of magnitudes, *P, Q, R* acting along *GA, GB, GC* are in equilibrium. Show that $\frac{P}{GA} = \frac{Q}{GB} = \frac{R}{GC}$.
6. 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 coefficient of friction.
7. Find the centre of mass of a solid hemisphere of a radius a.
8. Show that the greatest inclination of a rough inclined plane to the horizon so that a particle will remain on it at rest, is equal to the angle of friction.

Section C

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

9. The resultant of two forces of magnitudes *P* and *Q* acting at a point, has magnitudes $(2n+1)\sqrt{P^2+Q^2}$ and $(2n-1)\sqrt{P^2+Q^2}$ when the forces are inclined at α and $90^\circ - \alpha$ respectively. Show that $tan\alpha = \frac{n-1}{n+1}$.

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10. Forces of magnitudes $2,\ \sqrt{3},\ \sqrt{5},\ \sqrt{3},\ 2$ respectively act at one of the angular points of a regular hexagon towards the other five points in order. Show that their resultant is of magnitude 10 and makes an angle of 60° with the first force.

11. A weight is supported on a smooth plane of inclination α by a sting inclined to the horizon at an angle γ. If the slope of the plane be increased to β and the slope of the string be unaltered, the tension of the string is doubled. Prove that $cot\alpha - 2cot\beta = tan\gamma$.

12. If a particle of mass *m* on a rough incline plane is inclined at angle α to the horizontal and if a force of magnitude *S* acting on it in a direction making an angle θ with the plane is in limiting equilibrium then find *S*.

13. Find the centre of mass of a solid right circular cone.

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