B.Sc. DEGREE EXAMINATION,APRIL 2019
II Year IV Semester
STATICS

Time : 3 Hours **Max.marks :75**

Section A $(10 \times 2 = 20)$ Marks

Answer any **TEN** questions

1. State Newton's laws of motion.
2. State Hooke's law.
3. State the Triangle law of forces.
4. State Lami's theorem.
5. State any two laws of friction.
6. Define angle of friction.
7. Define moment of a couple.
8. What is arm and axis of a couple?
9. Differentiate between centre of mass and centre of gravity.
10. Give the mass centre of a lamina in the form of a sector of a circle.
11. When does the resultant of a system of coplanar forces reduce to (i) a single force, (ii) a couple?
12. What is the mass centre of three uniform rods forming a triangle?

Section B $(5 \times 5 = 25)$ Marks

Answer any **FIVE** questions

13. The magnitude of the resultant of two given forces P, Q is R. If Q is doubled, then R is doubled. If Q is reversed, then R is also doubled. Show that $P : Q : R = \sqrt{2} : \sqrt{3} : \sqrt{2}$.
14. Let O be the orthocentre of the triangle ABC. If forces of magnitude P, Q< R acting along OA, Ob, OC are in equilibrium, show that $\frac{P}{a} = \frac{Q}{b} = \frac{R}{c}$.
15. A uniform plank *AB* of length 2a and weight *W* is supported horizontally on two horizontal pegs *C* and *D* at a distance d apart. The greatest weights that can be placed at the two ends in succession without upsetting the plank are W_1 and W_2 respectively. Show that $\frac{W_1}{W + W_1} + \frac{W_2}{W + W_2} = \frac{d}{a}$.

16. Show that the moment of a couple is independent of the point about which the moment is obtained.
17. 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.
18. Let E be the midpoint of the side CD of a square ABCD. Forces $16, 20, 4\sqrt{5}, 12\sqrt{2}$ act along $\overline{AB}, \overline{AD}, \overline{EA}, \overline{CA}$. Show that they are in equilibrium.
19. Find the mass centre of triangular lamina.

Section C $(3 \times 10 = 30)$ Marks

Answer any **THREE** questions

20. Find the magnitude and direction of the resultant of two forces $\vec{F_1}$ and $\vec{F_2}$.
21. Find the least force required to drag a particle on a rough horizontal plane and show that the least force acts in a direction making with the horizontal, an angle equal to the angle of friction.
22. State and prove Varignon's theorem.
23. *P, Q, R* are points on the sides *BC, CA, AB* of a triangle *ABC*, dividing them internally in the same ratio$1 + \lambda : 1 - \lambda$. Show that the forces $\overline{AP}, \overline{BQ}, \overline{CR}$ acting at *A, B, C* are equivalent to a couple of moment $2\lambda\Delta$, where Δ is the area of the triangle *ABC*.
24. Find the mass centre of a solid hemisphere of radius *'a'* using integration.

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