

SECTION – C (3 X 10 =30)

Answer ALL the questions.

19. a) State and prove Varignon's theorem.

(Or)

b) Two forces of magnitude F_1 and F_2 act at a point. They are inclined at an angle α . If the forces are Interchanged, show that their resultant is turned through the angle $2\left(\tan^{-1}\left(\frac{F_1-F_2}{F_1+F_2}\tan\frac{\alpha}{2}\right)\right)$

20. a) ABCDEF is regular hexagon. Forces AB,2BC,3DC,2ED,5EF, 6AF act at A,B,C,D,E,F respectively. Show that they are equivalent to a couple and find its moment.

(Or)

b) A Ladder of length 1 rests on a rough horizontal ground with its upper end projecting slightly over a smooth horizontal rod at a height h above the ground. If the ladder is about to slip, show that the coefficient of friction is equal to $\frac{h\sqrt{l^2-h^2}}{l^2+h^2}$.

21. a) A telegraph wire, stretched between two points at a distance 'a' feet apart, sags n feet in the middle. Prove that the tension at the ends is approximately $w\left(\frac{a^2}{8n} + \frac{7}{6}n\right)$, where w is the weight per unit length of the wire.

(Or)

b) Find the centre of gravity of a plane lamina of uniform density in the form a quadrant of ellipse.

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