

Total number of printed pages-5

53 (ME 201) ENMC

2021

ENGINEERING MECHANICS

Paper : ME 201

Full Marks : 100

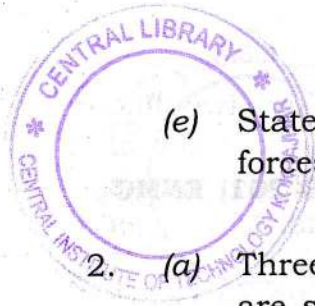
Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer **any five** questions.

1. (a) Differentiate between statics, kinetics and kinematics. 4
- (b) State the effects, which a force may produce, when it acts on a body. 4
- (c) What is a system of forces? Enumerate the characteristics of a force. 4
- (d) State the unit of force into CGS, MKS and SI system of units. How are they related to each other? 3

Contd.



- (e) State and prove parallelogram law of forces. 5
2. (a) Three coplanar forces acting at a point are stated to be in equilibrium. Show that each force is proportional to the sine of the angle between the other two forces. 6
- (b) Define the term free body diagram and state the importance of drawing such a diagram. 4
- (c) A force of $200N$ is resolved into two components. If one of the components is equal to $120N$ and makes an angle of 30° with the $200N$ force, find the other component and the angle between the components. 6
- (d) Three forces $2P$, $3P$ and $4P$ act along three sides of an equilateral triangle taken in order. Find the magnitude and line of action of the resultant force. 4
3. (a) Define moment and moment of force. State Varignon's theorem. 3

- (b) Find the magnitudes of the two like parallel forces acting at a distance of 24cm , whose resultant is 200N and its line of action is at a distance of 6cm from one of the forces. 3
- (c) Three like parallel forces 20N , 40N and 60N are acting at points A , B and C respectively on a straight line ABC . The distances are $AB = 3\text{m}$, $BC = 4\text{m}$. Find the resultant and also the distance of the resultant from point A on line ABC . 4
- (d) A lamp weighing 5N is suspended from the ceiling by a chain. It is pulled aside by a horizontal chord until the chain makes an angle of 60° with the ceiling. Determine the tensions in the chain and the chord. 7
- (e) The resultant of two equal forces (P) acting at a point also equals to (P). Determine the angle between the two forces. 3
4. (a) Differentiate between : 5
- (i) Static and kinetic friction
 - (ii) Sliding and rolling friction.



(b) Define the following terms : 4

(i) Angle of friction

(ii) Cone of friction.

(c) The force required to pull a body of weight $100N$ on a rough horizontal plane is $30N$. Determine the co-efficient of friction, if the force applied is at an angle of 15° with the horizontal. 5

(d) Find the least friction required to pull a body of weight (W) placed on a rough horizontal plane, when the force is applied at an angle (θ) with the horizontal. 6

5. (a) Find the centre of gravity of an I-section with top flange $100mm \times 20mm$, web $200mm \times 30mm$ and bottom flange $300mm \times 40mm$. 6

(b) How many centres of gravity a body has? How would you find out the centre of gravity of a section with a cutout hole? 4

- (c) Find the moment of inertia of a T-section with flange as $150\text{mm} \times 50\text{mm}$ and web as $150\text{mm} \times 50\text{mm}$ about X-X and Y-Y axes through the centre of gravity of the section. 10

6. A cantilever truss is loaded as shown in Fig. (i). Find the forces in all members of the truss. 20

