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Total Pages : 3

**013305**

**December 2023**

**B.Tech. [ME/ME(Hindi Medium)]- IIIrd SEMESTER**

**Engineering Mechanics (ESC-203A-21)**

Time : 3 Hours]

[Max. Marks : 75

*Instructions :*

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*
4. *Symbols have their usual meanings.*

**PART-A**

1. (a) Define Coplanar and Concurrent Forces. (1.5)
- (b) What is Rigid Body equilibrium of forces? (1.5)
- (c) What is limiting friction? (1.5)
- (d) Define wedge friction. (1.5)
- (e) What is Zero force member in truss? (1.5)
- (f) What is centre of gravity? (1.5)
- (g) What is conservative force? (1.5)
- (h) Define rectilinear motion. (1.5)

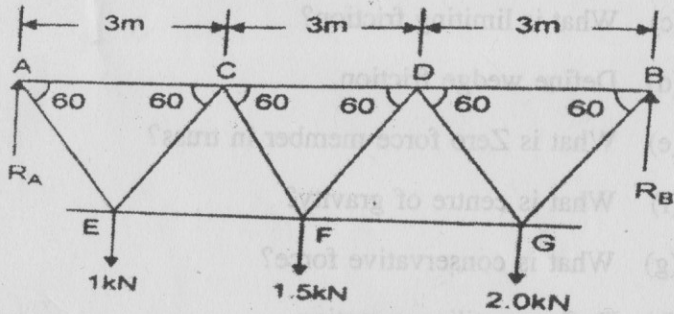
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**101** [P.T.O.]

- (i) Differentiate between Frames & Machines. (1.5)
- (j) What is virtual work? (1)

**PART-B**

2. (a) Two concurrent 50 N forces and 150 N act on the body along directions at  $0^\circ$  and  $60^\circ$  to X-axis respectively. Find the magnitude and direction of the resultant. (10)
- (b) Explain the concepts of Particle equilibrium in 2-D and 3-D. (5)
3. A body of weight  $W$  is placed on a rough inclined plane having an inclination angle  $\alpha$  to the horizontal. The force  $P$  is applied to the horizontal to drag the body. If the body is on the point of motion up the plane, prove that  $P$  is given by  $P = W \tan(\alpha + \Phi)$ . Where  $\Phi$  = Angle of friction. (15)
4. Calculate forces in members in the plane truss loaded as shown below in figure: (15)



5. (a) Derive a relationship for finding the moment of inertia of a triangle. (10)
- (b) Explain the principle of virtual work for particles and ideal system of rigid bodies. (5)
6. (a) Explain the impulse-momentum theorem with a suitable example, (10)
- (b) State newton's 2nd law of motion. (5)
7. A body starts from rest with an acceleration given by  $a = 10 - 0.006 S^2$ . Find the velocity of the body when it has travelled 20 m. also, find the distance covered by the body when it comes to rest Here  $a$  = acceleration ( $m/s^2$ ),  $S$  = distance (m). (15)