

3E1207

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B.Tech. III sem. (Main) Examination, April/May - 2022

Automobile Engineering

3AE3-04 Engineering Mechanics

AE, ME

Time : 2 Hours

Maximum Marks : 70

**Instructions to Candidates:**

Attempt all ten questions From Part A, All five Questions from Part B and three questions out of five questions from Part C.

Schematic diagram must be shown wherever necessary. Any data missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting materials is permitted during examination (As mentioned in form No. 205).

**Part - A (Word limit 25)**

1. What's the difference between a moment and a couple?
2. Why to Provide Redundant Members in trusses?
3. Define radius of gyration.
4. What is the difference between worm and worm wheel?
5. What is importance of friction in our daily life?
6. Why is crowning on a pulley?
7. Define projectile motion with example.
8. Why is D'Alembert's principle used?
9. What do you mean by work energy principle?
10. What is the relation between momentum and impulse? (10×2=20)

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**PART - B (Word limit 100)**

1. From the truss in Figure 1, determine the force in members BC, CE, and EF. Solve by using method of sections.

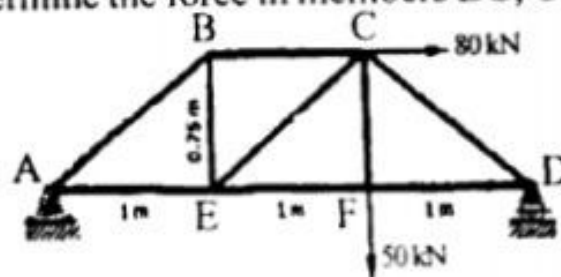


Figure: 1

(1)

[Contd....]

2. Explain the Law of machine and using following table shows observations on a certain machine. Find the law of machine equation and maximum Mechanical advantage.

Load	Effort
100 N	10 N
200 N	14 N

3. Derive the tension ratio equation of flat belt drive.  
 4. Define and explain Newton's law of motion for rotational motion.  
 5. Explain the principle of work and energy and derive an expression for the same. (5×4=20)

### PART - C (Any three)

1. Given the forces  $F_1 = 2.91\text{ N}$ ,  $F_2 = 2.67\text{ N}$ ,  $F_3 = 2.47\text{ N}$  and  $F_4 = 2.23\text{ N}$  and the angles  $\alpha = 60^\circ$  and  $\beta = 30^\circ$ , calculate the resultant force R and its angle  $\gamma$  with the x-axis

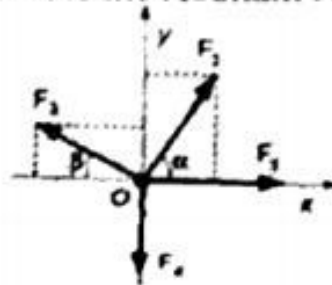


Figure: 2

2. Find the moment of inertia about the vertical and horizontal axis passing through the centroid of the section shown in figure - 3.

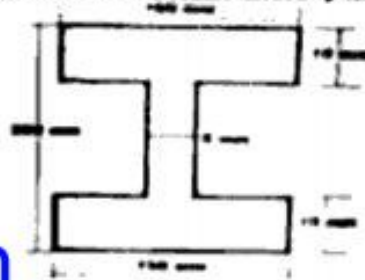


Figure: 3

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3. A ladder of weight 390 N and 6m long is placed against a vertical wall at an angle of  $30^\circ$  with wall. The co-efficient of friction between the ladder and the wall is 0.25 and that between ladder and floor is 0.38. Find how high a man of weight 1170 N can ascend, before the ladder begins to slip.
4. A balloon weighing 'W' newton descend with acceleration of 'a'. If weight 'w' is removed from the balloon has upward acceleration of 'a'. Show that  $w = \frac{2aW}{a+g}$
5. A pile hammer of 250 kg mass is made to fall freely on a pile from a height of 6 m. If the hammer come to rest in 0.012 sec, determine
- The change in momentum,
  - Impulse and
  - Average force.
- (3×10=30)