

22240

23124

3 Hours / 70 Marks

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.
- (2) Illustrate your answer with neat sketches wherever necessary.
- (3) Figures to the right indicate full marks.
- (4) Assume suitable data, if necessary.
- (5) Use of Non-programmable Electronic Pocket Calculator is permissible.
- (6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

- 1. Attempt any FIVE of the following: **10****
- a) State the Lamis Theorem of forces.
- b) Explain the methods of resolution of forces.
- c) Define potential energy and kinetic energy.
- d) State the machine and explain reversible machine.
- e) Define modulus of elasticity and modulus of rigidity.
- f) Differentiate mass and weight.
- g) Classify cam and followers.

P.T.O.

2. **Attempt any THREE of the following:** 12
- State three Newton's law of motion.
 - In a lifting machine, an effort of 70 N is to be moved by a distance of 4 m to raise the load of 11000 N by a distance of 1 m. Determine the mechanical advantage, velocity ratio and efficiency of the machine.
 - A screw Jack lifts a load of 30 kN by an effort of 400 N applied at the end of lever arm of length 750 mm. If the pitch of screw is 6 mm. Find the efficiency of machine.
 - Explain with neat sketch geometry of 'V' belt.
3. **Attempt any THREE of the following:** 12
- At construction site two single purchase crab with velocity ratio of 70 and 90 are available. Choose any one and justify your choice.
 - Explain the stress-strain diagram for ductile material with a neat sketch.
 - A 4 m long steel rod must not stretch more than 3 mm and the normal stress must not exceed 150 MPa. When the rod is subjected to a 10 kN axial load knowing that $E = 200 \text{ GPa}$, determine the required diameter of rod.
 - Discuss various criteria for selection of factor of safety.
4. **Attempt any THREE of the following:** 12
- The following observations are made during tension test carried out on a 15 mm diameter plain carbon steel rod: Yield load = 68 kN, Ultimate tensile load = 105 kN, find the yield strength and ultimate tensile strength of the rod.
 - Explain rated life of bearing with an example.
 - Explain different types of bearings and state application of each.
 - A nylon thread is subjected to an 85 N tension force. Knowing that $E = 3.3 \text{ GPa}$ and that the length of the thread increases by 1.1% determine :-
 - Diameter of the thread.
 - The stress in the thread.
 - Explain the procedure for selection of bearing from manufactures catalogue.

5. Attempt any TWO of the following:**12**

- a) Explain any three inversions of four bar mechanism.
- b) Explain work of force and work of couple moment.
- c) State the advantages and disadvantages of chain drive over the belt drive.

6. Attempt any TWO of the following:**12**

- a) Explain simple, compound and epicyclic gear trains with neat sketches.
 - b) Explain with neat sketch obtaining stress-strain curve with the help of UTM.
 - c) Differentiate between centrifugal force and centripetal force.
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