

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER- III (NEW) EXAMINATION – SUMMER 2022

Subject Code:3130608

Date:20-07-2022

Subject Name:Mechanics of Solids

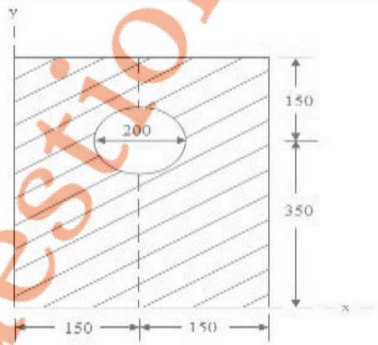
Time:02:30 PM TO 05:00 PM

Total Marks:70

Instructions:

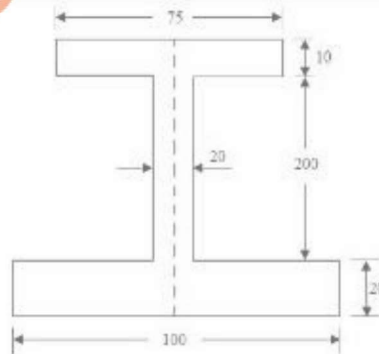
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

- | | | Marks | |
|----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--|
| Q.1 | (a) Define: (1) Rigid Body (2) Newton’s second law (3) Law of Transmissibility. | 03 | |
| | (b) State and explain parallelogram law of forces. | 04 | |
| | (c) The following forces act at a point:
(1) 20 N inclined at 30° towards North of East,
(2) 25 N towards North,
(3) 30 N towards North West,
(4) 35 N inclined at 40° towards South of West.
Find magnitude and direction of the resultant force. | 07 | |
| | Q.2 | | |
| | (a) Differentiate between Moment and Couple. | 03 | |
| (b) State and explain Lami’s theorem. | 04 | | |
| (c) Find the moment of inertia of a plate with a circular hole about its centroidal x axis as shown in figure below. | 07 | | |

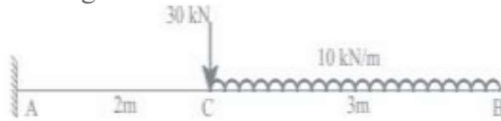


OR

- (c) Find the position of the centroid of I-section as shown in Figure. **07**

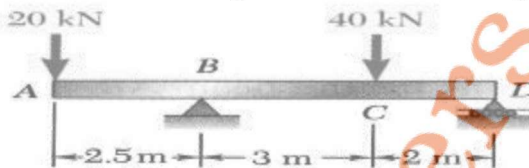


- Q.3** (a) Explain: (1) Types of beams (2) Types of reactions. **03**
 (b) State Hook's law. Draw stress strain curve for MS specimen and explain each point in detail. **04**
 (c) Determine the support reactions for the beam shown below. Also plot SF and BM diagrams. **07**



OR

- Q.3** (a) Define stress. Also explain types of stresses. **03**
 (b) Determine support reaction for the given beam shown in figure below. **04**

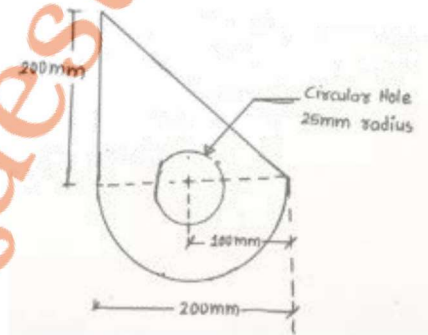


- (c) For above figure draw SF and BM diagram with calculation. **07**

- Q.4** (a) Discuss critically the assumption made in theory of Pure Bending. **03**
 (b) State and explain Verignon's principle. **04**
 (c) A reinforced concrete column is applied 700 kN load. Size of column is 250mm X 450mm, and it is reinforced with 6 bars of 20mm dia. Determine load taken by column and steel. **07**

OR

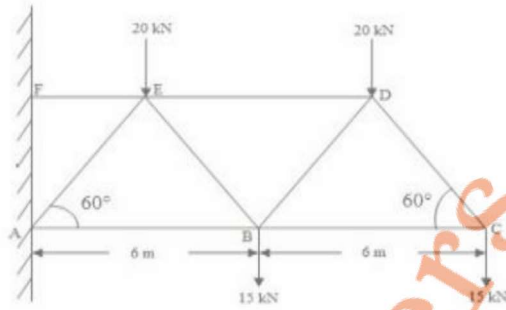
- Q.4** (a) What is difference between deficient truss and Redundant truss. **03**
 (b) Derive the formula for the elongation of a rectangular bar under the action of axial load. **04**
 (c) Determine the centroid of the section shown in Figure below. **07**



- Q.5** (a) State parallel axes and perpendicular axes theorems. **03**
 (b) Derive torsion equation with usual notations. **04**
 (c) Draw the mohr's stress circle for direct stresses of 70 MN/m² (tensile) and 40 MN/m² (compressive) and estimate the magnitude and direction of the resultant stresses and planes making angles of 30° and 70° with the plane of the first principal stress. Find also the normal and tangential stresses on these planes. **07**

OR

- Q.5 (a) Describe the Mohr's circle method to calculate principal stresses. 03
(b) Derive assumption made in analysis of truss. 04
(c) Determine the forces in the members DE, BE and AB of the truss, shown in figure below. 07



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