

**GUJARAT TECHNOLOGICAL UNIVERSITY**

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

**Subject Code:3130608**

**Date:20-07-2022**

**Subject Name:Mechanics of Solids**

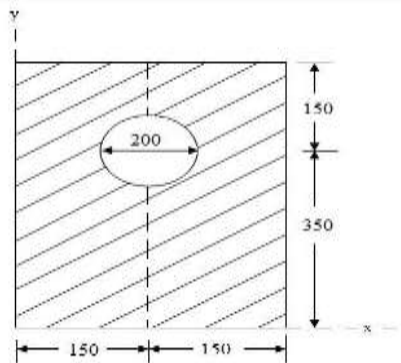
**Time:02:30 PM TO 05:00 PM**

**Total Marks:70**

**Instructions:**

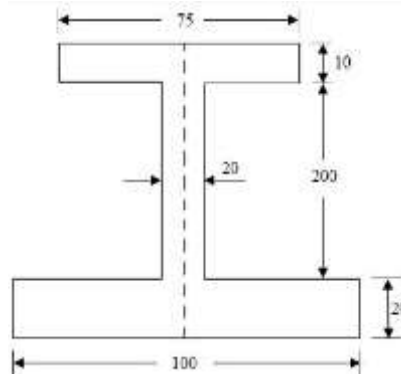
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

- |   | <b>Marks</b> |
|---|--------------|
| <b>Q.1 (a)</b> Define: (1) Rigid Body (2) Newton’s second law (3) Law of Transmissibility.                                  | <b>03</b>    |
| <b>(b)</b> State and explain parallelogram law of forces.   | <b>04</b>    |
| <b>(c)</b> The following forces act at a point:   | <b>07</b>    |
| (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.  |              |
| <br><b>Q.2 (a)</b> Differentiate between Moment and Couple.   | <b>03</b>    |
| <b>(b)</b> State and explain Lami’s theorem.  | <b>04</b>    |
| <b>(c)</b> Find the moment of inertia of a plate with a circular hole about its centroidal x axis as shown in figure below. | <b>07</b>    |

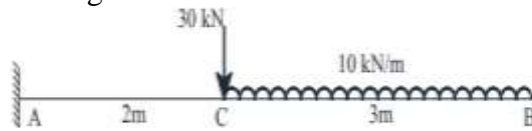


**OR**

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

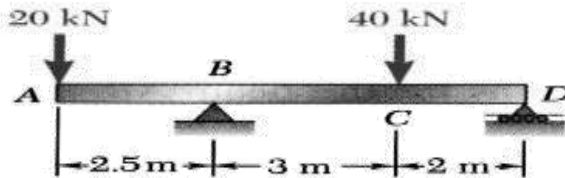


- Q.3** (a) Explain: (1) Types of beams (2) Types of reactions. **03**  
 (b) State Hook's law. Draw stress strain curve for MS specimen and explain each point in detail. **04**  
 (c) Determine the support reactions for the beam shown below. Also plot SF and BM diagrams. **07**



**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**

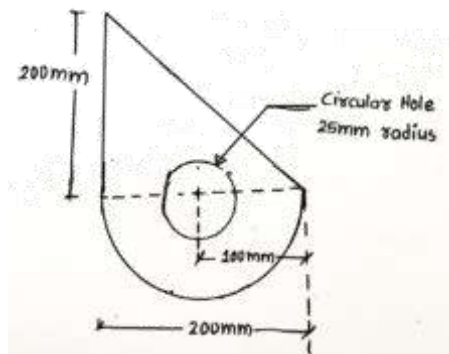


- (c) For above figure draw SF and BM diagram with calculation. **07**

- 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**

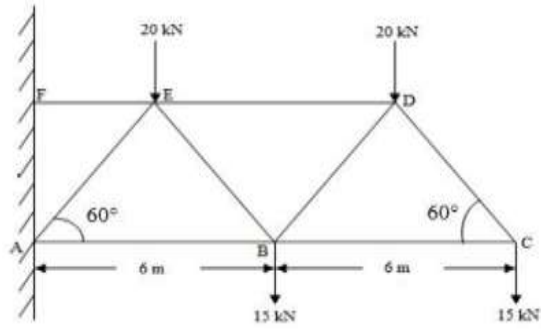
- Q.4** (a) What is difference between deficient truss and Redundant truss. **03**  
 (b) Derive the formula for the elongation of a rectangular bar under the action of axial load. **04**  
 (c) Determine the centroid of the section shown in Figure below. **07**



- 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/m<sup>2</sup> (tensile) and 40 MN/m<sup>2</sup> (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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