Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

Diploma Engineering - SEMESTER–III • EXAMINATION – WINTER • 2014

Subject Code: 3330604 **Date: 01-12-2014**

Subject Name: Structural Mechanics

Time: 10:30 am - 01:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **English version is considered to be Authentic.**

Q.1 Answer any seven out of ten. **14**

1. Differentiate between Tensile and compressive loads.
2. Enlist different types of structures.
3. Enlist different types of supports.
4. Differentiate between direct stress and shear stress.
5. Differentiate between lateral strain and linear strain.
6. Differentiate between Young's modulus and Bulk modulus.
7. Differentiate between Resilience and proof resilience.
8. Differentiate between Poisons ratio and Modular ratio.
9. Differentiate between sign conventions for Shear force and Bending moment.
10. Differentiate between perfect truss and imperfect truss.

Q.2 (a) Explain stress-strain graphical relationship for mild steel with neat sketch. Also explain the methodology to calculate Young's modulus from the graph. **03**

OR

(a) A force of 314kN acts on a wire of 20 mm diameter and the wire gets elongated by 5%. Determine the stress and strain. Also calculate the corresponding value of Young's modulus. **03**

(b) Explain different types of elastic constants and inter-relationship between elastic constants and poison's ratio. **03**

OR

(b) Enlist various components of roof truss with the help of a neat sketch. **03**

(c) Define principle of superposition. Also derive an expression for change in length for a bar of three different and increasing cross-section under axial forces. **04**

OR

(c) Draw the BMD and SFD for a simply supported beam shown in **Fig. 1**. **04**

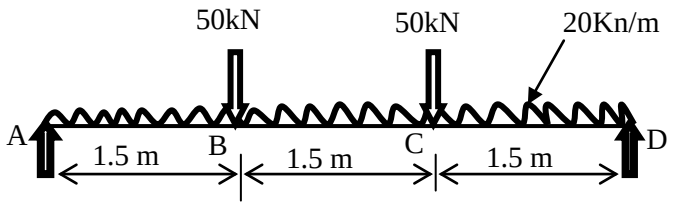

Fig. 1

(d) Derive an expression bending equation to calculate bending stress in beams. **04**

OR

(d) Give the basic assumptions for the theory of pure bending of beams. **04**

Q.3 (a) Define point of contraflexure by means of an example and state the value of shear force and bending moment at that point. **03**

OR

(a) For the given beam, draw the shear force diagram in **Fig. 2**. **03**

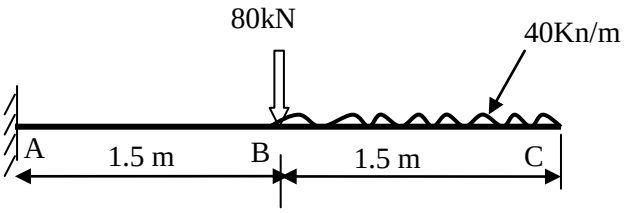

Fig. 2

(b) Differentiate between statically determinate and indeterminate beams by taking a suitable example of a beam. **03**

OR

(b) Explain the equation for shear stress in beams. Also define various terms associated with this equation. **03**

(c) Determine the maximum shear stress in the beam shown in Fig. 2, which has a Cross sectional size 115 mm x 300 mm. Also find the shear stress at the free end of this beam. **04**

OR

(c) Determine I_{xx} and I_{yy} for some standard cross sections given below: **04**

(i) Circular section of diameter 1.0m,

(ii) Rectangular section of width 230mm and depth 450 mm.

(d) Derive an expression for change in length in a cross section having three increasing cross sections. The diameter of the three sections (each of equal length) is d, 1.3d and 1.6d respectively. **04**

OR

(d) Draw the SFD and BMD for two cantilever beams (span=3.0m) specified below: **04**

(i) Free end loaded with a point load of 100 kN.

(ii) Whole span loaded with uniformly distributed load 20kN/m.

Q.4 (a) Derive an expression for strain energy for gradual loads. **03**

OR

(a) A rectangular bar 60 mm wide and 40 mm thick, 1 m in length is subjected to axial tensile force of 50 kN. If E= 1.5 X 10^5 N/mm2, find the amount of strain energy. **03**

(b) Differentiate between strut and column. Also state method to identify a column type like short or column. **04**

OR

(b) Differentiate a truss from a beam. Also state how to know a truss types like Redundant truss or Deficient truss. **04**

(c) An R.C.C. column 230 mm x 300 mm is reinforced with 4 Nos. of 16 mm diameter steel bars. If permissible stresses in the concrete and Steel are 5 N/mm2 and 190 N/mm2, respectively, find the total load carried by the column. **07**

Q.5 (a) Draw a suitable sketch for shear stress distribution pattern for the followings: Rectangular beam, (ii) I-Section beam and (iii) T-Section beam. **04**

(b) Determine the member forces for the given truss in **Fig. 3**. **04**

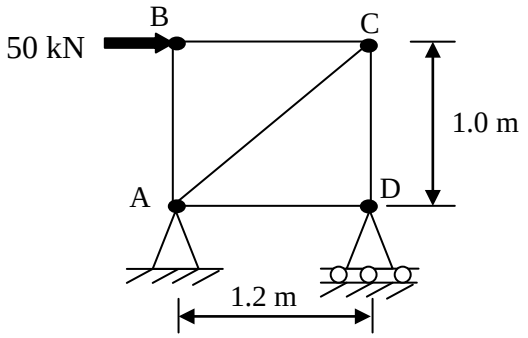

Fig. 3

(c) Enlist the basic assumptions for an ideal truss. **03**

(d) If the cross section of the beam shown in **Fig. 1** is 230 mm x 450 mm, find the maximum bending stress in the beam. **03**

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