

# C. U. SHAH UNIVERSITY

## Winter Examination-2020

**Subject Name: Structural Analysis - I**

**Subject Code: 4TE03STA1**

**Branch: B.Tech (Civil)**

**Semester: 3**

**Date: 10/03/2021**

**Time: 11:00 To 02:00**

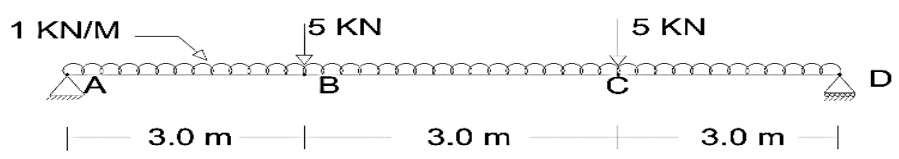
**Marks: 70**

**Instructions:**

- (1) Use of Programmable calculator & any other electronic instrument is prohibited.
- (2) Instructions written on main answer book are strictly to be obeyed.
- (3) Draw neat diagrams and figures (if necessary) at right places.
- (4) Assume suitable data if needed.

- Q-1 Attempt the following questions: (14)**
- a) What is elasticity ? (1)
  - b) What is taper section ? (1)
  - c) Define stress. (1)
  - d) What is strain? (1)
  - e) What is the Difference between Prismatic and Non Prismatic Section? (1)
  - f) Define Resilience. (1)
  - g) What is Yielding? (1)
  - h) Define Eccentric load. (1)
  - i) Define Axial Load. (1)
  - j) Define radius of gyration (k). (1)
  - k) What is effective length for column when both ends hinged (1)
  - l) Define slenderness ratio. (1)
  - m) Define strain energy in brief. (1)
  - n) Enlist various types of Load acting on beam. (1)

**Attempt any four questions from Q-2 to Q-8**

- Q-2 Attempt all questions (14)**
- (A) Draw shear force and bending moment for following beam (8)
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- (B) Explain various types, supports and beams in detail. (6)

- Q-3 Attempt all questions (14)**
- (A) A RCC column 300mm in dia reinforced with 6 Nos of 16mm dia steel bars if permissible stress in steel and concrete are  $230 \text{ N/mm}^2$  and  $5 \text{ N/mm}^2$ . Respectively find load carrying capacity of column. (7)



- (B) A steel bar 2m long and 20mm diameter is acted upon by 50 KN compressive force. If  $E = 2 \times 10^5 \text{ N/mm}^2$  and Poisson's ratio is 0.25, find change in length and diameter, linear strain, lateral strain. (7)
- Q-4 Attempt all questions (14)**
- (A) Derive the expression for the energy due to bending for a beam simply supported at the ends loaded with a udl  $w$ /unit run over entire span. (7)
- (B) An load of 100 N falls through a height of 20mm on to a collar rigidity attached to the lower end of the vertical bar 1.5 m long and of  $150 \text{ mm}^2$  cross sectional area. The upper end of the vertical bar is fixed. Find :  
Maximum instantaneous stress induced in the vertical bar  
instantaneous elongation  
strain energy stored in the bar.  
Take  $E = 200 \times 10^3 \text{ N/mm}^2$ . (7)
- Q-5 Attempt all questions (14)**
- (A) Explain principle of super position with neat sketch (7)
- (B) A fixed beam, span 4m is loaded with uniformly distributed load of  $1.5 \text{ kN/m}$  throughout the span. During loading left support rotates clockwise by 0.001 radian, determine the fixed end moments and draw a BM diagram.  $EI = 1 \times 10^{10} \text{ N-cm}^2$ . (7)
- Q-6 Attempt all questions (14)**
- (A) Determine slope and deflection at the free end of a 2.0 m long cantilever beam with 30kN load acted on its free end.  
 $E = 2 \times 10^5 \text{ N/mm}^2$   $I_{xx} = 6 \times 10^8 \text{ N/mm}^2$  (7)
- (B) Drive kernel (Core) of section for rectangular and circular section. (7)
- Q-7 Attempt all questions (14)**
- (A) A short column rectangular section 250mm x 200 mm is subjected to a load of 400 KN at a point 50 mm from longer side and 100 mm from shorter side. Find maximum and minimum stresses in the column. (7)
- (B) A hollow cast iron column has outside diameter 200mm and thickness of 20mm. It is 4.5m long and fixed at both ends. Calculate the safe load and ratio of Euler's and Rankine's critical load. For cast iron  $F_c = 550 \text{ N/mm}^2$ ,  $\alpha = 1/1600$  and  $E = 0.8 \times 10^5 \text{ N/mm}^2$ . (7)
- Q-8 Attempt all questions (14)**
- (A) Derive strain energy due to impact loading. (7)
- (B) Explain the Mohr-Circle Method for locating principal axes. (7)

