

# C.U. SHAH UNIVERSITY

## Summer Examination-2019

**Subject Name: Structural Analysis - I****Subject Code: 4TE03STA1****Branch: B.Tech (Civil)****Semester: 3****Date: 15/03/2019****Time: 2:30 To 05:30****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 do you mean by ductile material? (1)
  - b) Define elasticity. (1)
  - c) What is strain? (1)
  - d) Average modulus of elasticity of steel is..... (1)
  - e) Define shear stress. (1)
  - f) What is strut? (1)
  - g) Write equation for calculating maximum deflection of beam. (1)
  - h) Enlist various method for calculating slope and deflection at a point in beam. (1)
  - i) What do you mean by proof resilience? (1)
  - j) Write equation for calculating strain energy due to sudden loading. (1)
  - k) What is point of Contraflexure (1)
  - l) Define maximum and minimum stresses. (1)
  - m) What do you mean by shear force? (1)
  - n) What is kernel of section? (1)

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

- Q-2**      **Attempt all questions** **(14)**
- (A) Enlist various type supports, beam and load and explain in detail. **(7)**
  - (B) An I- section fix at one end and hinged at other end is used as a column of 5.0 m length to carry safe compressive load of 400 kN. Factor of safety is 4.0,  $A = 8025 \text{ mm}^2$ ,  $I_{xx} = 2.30 \times 10^8 \text{ mm}^4$ ,  $I_{yy} = 2.25 \times 10^7 \text{ mm}^4$ , Rankine constant  $\alpha = 1/1600$ . Calculate actual compressive stress in column. **(7)**

- Q-3**      **Attempt all questions** **(14)**
- (A) A circular bar having  $200 \text{ mm}^2$  area is subjected to axial load as shown in figure. **(7)**  
Find the value of P and the total elongation. Take  $E = 200 \text{ KN/mm}^2$ .



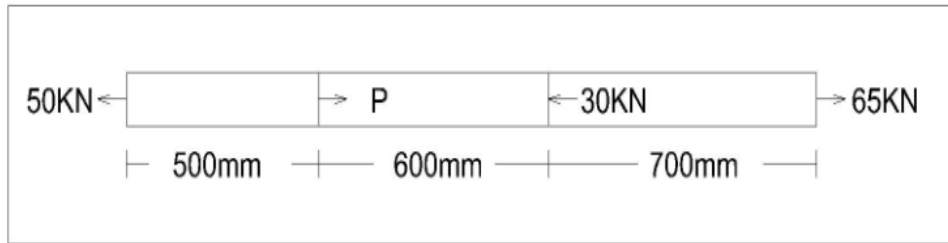
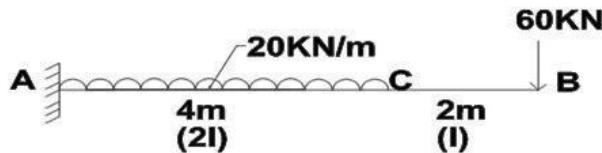


Fig.

- (B) A small concrete dam, triangular in cross section with one face vertical is 7 m high and 2.5 m wide at base. It has to retain water on its vertical face up to a depth 7 m. If unit weight of concrete is  $25 \text{ kN/m}^3$  and that of water  $10 \text{ kN/m}^3$ . Calculate maximum and minimum stress intensities induced at the base. Sketch also stress distribution diagram under the base of the dam. (7)

**Q-4 Attempt all questions (14)**

- (A) Derive equation for strain energy due to gradual loading (7)  
 (B) Find slope and deflection at point B for a cantilever beam shown in figure using Castiglione's first theorem. Take  $EI = 10 \times 10^{13} \text{ N.mm}^2$ . (7)



**Q-5 Attempt all questions (14)**

- (A) Explain stress strain curve for mild steel. (7)  
 (B) The ultimate tensile strength of mild steel is  $100 \text{ N/mm}^2$ . A tie bar of equal legs angle section has carry an axial pull of 110kN. Decide suitable dimensions of the section if the mean thickness is 10mm. Take the factor of safety 2. (7)

**Q-6 Attempt all questions (14)**

- (A) A beam ABCD in which  $AB=3\text{m}$ ,  $BC=5\text{m}$ , and  $CD=2\text{m}$  carries a point load of 4 kN each at A and D and U.D.L of  $4\text{kN/m}$  between B and C beam is simply supported at point B and C. Draw S.F and B.M diagram. (7)  
 (B) Write assumptions and limitations of Euler's formula. (7)

**Q-7 Attempt all questions (14)**

- (A) Derive an equation of maximum and minimum stress in rectangular section. (7)  
 (B) A column of T-section is subjected to a load of 110 kN at a point on the centroidal axis, 35mm below the centroidal x-x axis. Calculate the maximum and minimum stresses induced in the section. Thickness of flange is 25 mm, width of flange 170 mm, thickness of web 15 mm and depth of web is 180 mm (7)

**Q-8 Attempt all questions (14)**

- (A) Derive relation between S.F and B.M in beam (7)  
 (B) Derive equation for deformation of a body due to self-weight. (7)

