

SECOND YEAR B.Arch. DEGREE EXAMINATION, APRIL / MAY 2005
(1998 Scheme)

STRUCTURAL MECHANICS AND THEORY OF STRUCTURES-II

Time : Three Hours

Maximum : 100 Marks

Assume suitable data wherever necessary

I. Answer any five of the following :-

- (i) Explain bending and shear stresses in beams.
- (ii) Define shear force and bending moment
- (iii) Explain Torsional stresses.
- (iv) Explain combined effect of direct and bending stresses.
- (v) What is slenderness ratio and effective length of columns.
- (vi) Explain fixed beam and propped cantilever beam.
- (vii) What is portal Frames ? Explain.

(5 × 5 = 25 marks)

2. a) A rectangular beam 200mm deep and 300mm wide is simply supported over a span of 8meter. What uniformly distributed load per meter the beam may carry, if the bending stress is not to exceed 120N/mm^2 .

Or

- b) A simply supported wooden beam of span 1.3 meter having a cross section 150mm wide × 250mm deep carries a point load 'W' at the centre. The permissible stresses are 7N/mm^2 in bending and 1N/mm^2 in shearing calculate the safe load 'W'.

(15 marks)

3. a) A steel shaft 30mm diameter and 8 metre in length is to transmit certain twisting moment such that angle of twist is not to exceed 2.1 degree. Determine the value of twisting moment and maximum shear stress. $N = 0.8 \times 10^5 \text{ N/mm}^2$.

Or

- b) Derive the expression for Euler's crippling load of a column with one end fixed and the other end is free.

(15 marks)

4. a) A simply supported beam of span 8 metre is subjected to two concentrated loads 20KN and 40KN at 2 metre and 5 metre from left support respectively calculate central deflection and maximum deflection.

Or

Turn over

- b) A cantilever beam of length 4 metre carries a UDL of 1KN/m over the whole length. The beam is propped rigidly at the free end. If $E = 2 \times 10^5 \text{ N/mm}^2$, and $I = 1 \times 10^8 \text{ Nmm}^4$ determine (i) Reaction at the rigid prop, (ii) The deflection at the centre of the cantilever beam, and (iii) Magnitude and position of maximum deflection.

(15 marks)

5. a) State elapeyron's theorem of three moments and derive the expression.

Or

- b) A continuous beam ABC of span $AB = 4$ metre and $BC = 6$ meter, carries UDL of 6 KN/m and 10KN/m respectively. If the ends A and C are simple supported, find the support moment and draw S.F.D and B.M.D.

(15 marks)

6. a) A Portal frame of uniform section throughout its length ABCD, hinged at A and D with stiff joint at B and C, carries a vertical concentrated load 80KN at the centre of the beam BC. The column and beam are 5 metre and 4 metre lengths respectively. Draw B.M.D.

Or

- b) A portal frame ABCD of uniform section throughout has fixed at A and hinged at D with stiff joint at B and C. The columns and the beam are 5 metre and 4 metre lengths respectively. The frame carries UDL of 30KN/m over the beam length BC. Draw B.M.D.

(15 marks)