

FOURTH SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/  
TECHNOLOGY—OCTOBER, 2013

**THEORY OF STRUCTURES – II**  
(Common for CE, AR, EN, QS and WR)

[Time : 3 hours

(Maximum marks : 100)

PART—A

(Maximum marks : 10)

Marks

I Answer the following questions in one or two sentences. Each question carries 2 marks.

1. What is the value of the section modulus of a circular section of diameter “d” ?
2. What is meant by middle third rule ?
3. Sketch the typical shape of the bending moment diagram for a fixed beam with a central point load.
4. A simply supported beam and a fixed beam having same span is loaded with central point load of equal magnitude. What will be the ratio between the deflections ?
5. State the Clapeyron’s theorem of three moments. (5×2=10)

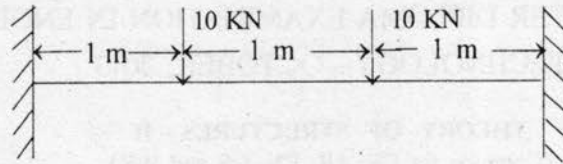
PART—B

(Maximum marks : 30)

II Answer *any five* of the following. Each question carries 6 marks.

1. Draw the bending stress distribution diagram with salient values of a simply supported beam of span 3 m with a central point load of 20 KN. The depth of the beam is 200 mm. Take  $I = 80 \times 10^6 \text{mm}^4$ .
2. Sketch the typical shape of the shear stress distribution diagram of a symmetrical I-section.
3. Derive the equation for the maximum slope of a simply supported beam with a U.D. load for the whole span by using Mohr’s theorem.
4. A fixed beam AB, 4 m long carries a point load of 70KN at its centre.  $I$  of the beam is  $70 \times 10^6 \text{mm}^4$  and  $E = 2 \times 10^5 \text{N/mm}^2$ . Find the fixed end moments and the deflection under the loads.
5. 3 members of uniform cross section meets at a point O are hinged at A and C and fixed at B. The length  $OA = 3\text{m}$ ,  $OB = 4\text{m}$  and  $OC = 3\text{m}$ . Moment of inertias are  $400 \text{mm}^4$ ,  $300 \text{mm}^4$  and  $500 \text{mm}^4$  respectively. Tabulate the distribution factors for the members and distributed moments when a moment of 5000 KN.m is applied at O.

6. Briefly explain the conditions of stability of a dam.  
 7. Calculate the fixing moment value of the fixed beam shown in the figure.



(5×6=30)

## PART—C

(Maximum marks : 60)

(Answer *one* full question from each unit. Each question carries 15 marks.)

## UNIT—I

- III (a) A beam of symmetrical section  $200 \text{ mm} \times 400 \text{ mm}$  is simply supported at the ends. It carries a UDL of  $20 \text{ kN/m}$  over the entire span. Find the maximum permitted span, if the maximum bending stress permitted is  $100 \text{ N/mm}^2$ . 9  
 (b) What are the assumptions in the theory of simple bending? 6

OR

- IV (a) Derive the formulae for shear stress at the section of a loaded beam. 8  
 (b) The average shear stress at the section of a simply supported rectangular beam of size  $100 \times 200 \text{ mm}$  is  $0.4 \text{ N/mm}^2$ . Determine :  
 (i) the shear force at the section  
 (ii) the maximum shear stress at the section  
 (iii) shear stress at a point on the section 50 mm above N.A. 7

## UNIT—II

- V (a) A square column  $200 \text{ mm}$  size is carrying a vertical load of  $200 \text{ kN}$  at an eccentricity of  $70 \text{ mm}$  in a plane bisecting the thickness. Determine the maximum and minimum intensities of stress and draw the stress diagram. 8  
 (b) A tank  $1 \text{ m}$  deep is filled half full with a liquid having specific gravity 2 while the remaining half is filled with a liquid having specific gravity 1.2. Sketch the pressure diagram for the side of the tank. Take specific weight of water as  $10 \text{ kN/m}^3$ . 7

OR

- VI A concrete dam of trapezoidal section having water on vertical face  $12 \text{ m}$  high. The base of the dam is  $7 \text{ m}$  wide and top  $3 \text{ m}$  wide. Find :  
 (a) The resultant thrust on the base per meter length of dam.  
 (b) The point where the resultant thrust cuts the base; and  
 (c) Intensities of maximum and minimum stresses across the base.

Take weight of concrete as  $25 \text{ kN/m}^3$  and the water level coinciding with the top.

(3×5=15)

UNIT—III

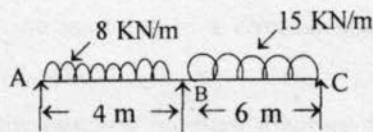
- VII (a) Derive an expression for the slope and deflection of a cantilever of span  $l$  with a UD load 'W' for the entire span by using Mohr's theorem. 8
- (b) A steel beam, simply supported over a span of 6 m carries a point load of 50 kN at 1.2 m from the left hand support. Find the position and magnitude of the maximum deflection. Take  $EI = 14 \times 10^{12} \text{ N-mm}^2$ . 7

OR

- VIII (a) Define the terms, slope and deflection in beams. 5
- (b) A beam of length 6 m and of uniform rectangular section is simply supported at its ends. It carries a UDL of 10 kN/m over the entire length. Calculate the depth and the breadth required if the permissible bending stress is 7 N/mm<sup>2</sup> and central deflection is not to exceed 10 mm. Take  $E = 1 \times 10^4 \text{ N/mm}^2$ . 10

UNIT—IV

- IX A continuous beam of uniform cross section is given in the figure. Draw the bending moment and shear force diagrams. 15



OR

- X Evaluate the bending moment diagram of the beam shown in figure by using moment distribution method. 15

