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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE, OCTOBER/NOVEMBER – 2018

DESIGN OF PRE STRESSED CONCRETE

(Note: IS:456-2000, IS:1343 are permitted)

[Maximum Marks: 100] [Time: 3 hours]

PART-A

[Maximum Marks: 10]

(Answer ***all*** questions in one or two sentences. Each question carries 2 marks)

I. 1. What do you mean by Balanced section.

2. What is modular ratio?

3. What do you mean by Cable?

4. Define section modulus.

5. What do you mean by loss of pre-stress due to anchorage slip. (5x 2 = 10)

PART-B

[Maximum Marks: 30]

(Answer any ***Five*** of the following questions. Each question carries 6 marks)

II. 1. Derive the expression for Moment of Resistance of a singly reinforced RCC sections using M20 concreted and Fe415 grade steel.

2. Differentiate Under reinforced and Over reinforced section..

3. Explain the basic assumptions in pre stressed concrete.

4. Explain pre tensioning or Hoyer system in prestressed concrete.

5. A pre-stressed concrete beam 400 x 600mm in section has a span of 8m and is subjected to udl of 12KN/m including the self weight of the beam. The presetressing tendons which are located along the longitudinal centroidal axis provide an effective prestressing force of 1000KN. Determine the extreme fibre stressess in concrete at the mid span section.

6. List the various types of losses in prestressed concrete beams.

7. In a post tensioned beam of length 18m, slip in the anchorage is estimated to be 5mm. If modulus of elasticity of steel is 2 x 10^5 N/mm^2, estimate the loss of prestress due to slip in anchorages.

(5x 6 = 30)

PART-C

[Maximum Marks: 60]

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

UNIT-I

III. (a). Calculate the design constants for M20 concrete and Fe250 grade steel (8)

(b). A rectangular beam of width 350mm is subjected to a uniformly distributed load of 15KN/m over an effective span of 8m. Calculate the area of tensile reinforcement required. Use M20 concrete and Fe250 grade steel. (7)

OR

IV. (a). A singly reinforced rectangular beam 350mm wide has a span of 8m and carries an all inclusive load of 12KN/m. If the stress in concrete and steel shall not exceed 7N/mm2 and we0N/mm2. Find the effective depth and the area of the tensile reinforcement. Take m=13.33. (8)

(b). A singly reinforced concrete beam 350mm wide and 550mm deep to the centre of the tensile reinforcement is reinforced with 3 bars of 16mm diameter. Find the Moment of resistance of the section. Use M20 concrete and Fe 415 grade steel. (7)

UNIT – II

V. (a). List the classification based on anachorages adopted and also explain Lee Mc Call system (8)

(b). What are the advantages of prestressed concrete. (7)

OR

VI. (a). Which materials are used in pre stressed concrete and why? (8)

(b). Explain the classification of pre stressed concrete on the basis of type of structures. (7)

UNIT – III

VII. (a). A pre stressed concrete beam 400mm x 600mm in section has a span of 8m and is subjected to a uniformly distributed load of 20KN/M including the self weight of the beam. The prestresing tendons are located at the lower third point and provide an effective pre stressing force of 1100KN. Determine the extreme fibre stresses in concrete at the mid span section. (8)

(b). A prestressed concrete beam of 400mm x 750mm rectangular cross section and span 10 meters supports a total udl of 250KNm excluding the weight of the beam. Calculate the area of the tendons and their position. The permissible stresses are 14N/mm^2 for concrete and 1050N/mm^2 for the tendon. (7)

OR

VIII. (a). A concrete beam of rectangular section 200mm wide by 500mm deep is pressed by a parabolic cable located at an eccentricity of 100mm at mid span and zero at the supports. If the beam has a span of 8 meters and carries a uniformly distributed live load of 5KN/m, find the effective force necessary in the cable for zero shear stress in the beam. For this condition, calculate the stress at mid section. Take weight of concrete equal to 25KN/m^3. (6)

(b). A prestressed concrete rectangular beam 300mm x 600mm is pre stressed with a force of 1600KN applied at 180mm from the bottom. Span of the beam is 10metres. Sketch the extreme fibre stresses at mid span. Assume specific weight of concrete as 25KN/m^3. (9)

UNIT-IV

IX. a). A post tensioned beam 200mm x 400 mm and 10 metres long is provided with straight tendons which are tensioned to 1050N/mm^2 at the jacking end. Find the loss of pre stress due to wobbling effect (i) at mid span and (ii) at the end remote from the jack. Take k = 0.03 per 100m. (8)

b). A pre tensioned concrete beam of size 100mm x 250mm is prestressed with a force of 120KN at an eccentricity of 50mm, estimate the loss of prestress. Take modulus of elasticity Es = 210KN /mm^2 and modulus of elasticity of concrete Ec = 35KNmm^2 (7)

OR

X. a). In a pre-stressed concrete beam of cross section 200mm x 300mm and span 6 metres, an initial prestressing force of 400KN is applied at an eccentricity of 70mm, by tendons of area 400mm^2. Assuming ES = 2 x 10^5 N/mm^2, Ec = 0.333 x 10^5 N/mm^2, anchor slip = 1.5mm, creep coefficient in concrete $\varnothing$ = 1, shrinkage of concrete = 0.0002 and creep loss in steel = 3% find the total percentage loss of stress in tendons. (8)

b). In a pre-tensioned beam of length 20m, slip in the anchorages is estimated to be 5mm. If modulus of elasticity of steel is 2 x 10^5 N/mm^2, Estimate the loss of pre-stress due to slip in anchorages. (7)