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Reg. No……………………
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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/
MANAGEMENT/COMMERCIAL PRACTICE, NOVEMBER – 2022

## DESIGN OF PRESTRESSED CONCRETE

[Note: - IS 456-2000, IS 1313 are permitted]

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



### (PART-A)
(Maximum Marks: 10)

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

1. What is lever arm.
2. Recall neutral axis.
3. Recall the term Prestressed concrete.
4. What is minimum section modulus?
5. State Creep coefficient. (5x2=10)

### (PART – B)
(Maximum Marks: 30)

II. Answer any five questions from the following. Each question carries 6 marks.

1. Explain the assumptions in working stress method.
2. Distinguish between under reinforced and over reinforced section.
3. Discuss the advantages of pre stressed concrete over reinforced concrete.
4. Explain pretension in pre stressed concrete.
5. Draw the stress distribution of prestressed beam with eccentric tendon.
6. Explain the loss of prestress due to shrinkage of concrete.
7. How do you compute the loss of stress due to shrinkage of concrete as per IS 1343 code recommendation. (5x6=30)

(PART – C)

(Maximum Marks: 60)

(Answer one full question from each Unit. Each full 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) Design a RC beam 200mm wide to resist a superimposed load of 6KN/M over the entire span of 6m. Use M20 concrete and Fe415 grade steel. No chack for shear and development length is required. (10)

(b) Derive the expression or Moment of Resistance of a singly reinforced RCC sections using M20 concreted and Fe415 grade steel. (5)

UNIT – II

V. (a) Explain the different systems of Post-tensioning. (10)

(b) List out any five applications of post-tensioning. (5)

OR

VI. (a) Explain the advantages of pre-tensioning system. (6)

(b) Explain the materials used in pre stressed concrete. (9)

UNIT-III

VII (a) A prestressed concrete beam of uniform rectangular cross section and span 10 meters supports a udl of 200KN/m including the weight of the beam. Determine the suitable dimensions of the beam . Take permissible stress of 14 $N/mm^2$ for concrete. (7)

(b) A prestressed concrete beam 400mmx600mm 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. Th prestressing 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)

III. (a) Explain the concepts of load balancing. (6)

(b) A rectangular concrete beam 150mm wide by 250mm deep spanning over 8 meters is pre stressed by a straight cable carrying an effective pre stressing force on 350 KN, at an eccentricity of 40mm. It carries a live load of 1.5 KN/m. Calculate the extreme stresses at the mid span. (9)

UNIT-IV

IX (a) Discuss the reasons for frictions losses and list the IS1343 recommended values for coefficient of friction and wave effect. (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 $2 \times 10^5$ N/mm$^2$, Estimate the loss of pre-stresses due to slip in anchorages. (7)

OR

X (a) A prestressed concrete beam of 8m long , 250mm x 400mm in cross section with an initial prestressing force of 500KN is applied at an eccentricity of 100mm, by tendons of area 500mm$^2$ . Assuming $E_s = 2 \times 10^5$ N/mm$^2$ , $E_c = 0.333 \times 10^5$ N/mm$^2$ , anchor slip =1.5mm, creep efficient in concrete 举 = 1, Shrinkage of concrete = 0.0002 and creep loss in steel = 3% , find the total percentage loss of stress in tendons (9)

(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 pre stress. Take modulus of elasticity $E_s$ = 210KN/mm$^2$ and modulus of elasticity of concrete $E_c$ = 35KN/mm$^2$ . (6)

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