Roll No											

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING
END TERM EXAMINATION - JUN 2023

Semester : Semester VI - 2020

Course Code : CIV3047

Course Name : Sem VI - CIV3047 - Fundamentals of Pre-Stressed Concrete Design

Program : CIV

Date : 19-JUN-2023

Time : 9.30AM -12.30PM

Max Marks : 100

Weightage : 50%

Instructions:

(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ALL THE QUESTIONS **(5 X 5 = 25M)**

1. For a prestressed concrete beam with a rectangular section 200mm x 400mm supporting a uniformly distributed load of 6kN/m, which includes self weight of the beam sketch a diagram indicating the location of pressure line. The effective span of the beam is 8m. The beam is concentrically prestressed by a cable carrying a force of 300kN. (CO1) [Knowledge]

2. What are the advantages of pre-stressed concrete? (CO1) [Knowledge]

3. State the advantages of pre-stressed concrete. (CO1) [Knowledge]

4. A prestressed concrete beam, 120mm wide by 300mm deep, is prestressed by a cable which has an eccentricity of 100mm at the cente span section. the span of the beam is 6m. If the beam supports 2 concentrated loads of 10kN each at one-third span points, determine the magnitude of the prestressing force in the cable for load balancing for the following cases: (CO1) [Knowledge]
Considering only live loads

5. Write short notes on the process of chemical prestressing. (CO1) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS **(3 X 10 = 30M)**

6. A post-tensioned simply-supported beam of span 8m is provided with a parabolic cable of area 800mm^2 with a slope of 1/20 at each end and is initially prestressed to 1200N/mm^2. Modulus of elasticity of steel is 210N/mm^2. Estimate the loss of prestress due to friction if coefficient of fricyion between the duct and cable is 0.5 and the wave effect = 0.0015/m. Also estimate the loss due to anchorage slip of 2mm at the jacking end during anchoring. (CO2) [Comprehension]

7. A prestressed concrete beam with a rectangular section 120mm wide and 300 mm deep supports a uniformly distributed load of 4 kN/m, which includes self weight of the beam. The effective span of the beam is 6m. The beam is prestressed by a cable carrying a force of 180 kN. If an effective tensile stress of 5 N/mm^2 is generated at the soffit of the beam, what is the eccentricity of the tendon?

(CO1) [Comprehension]

8. Estimate short term and long term deflection for a prestressed concrete beam of size 200 x 400mm. The span of the beam is 10m. It is prestressed by a parabolic cable with an eccentricity of 75mm at the mid-span and zero at the supports. The initial prestressing force is 600kN and there is 20% loss. It is subjected to a live load of 4kN/m. Modulus of elasticity of concrete is 35kN/mm^2 , creep coefficient is 2 and density of concrete is 24kN/m^2.

(CO2) [Comprehension]

PART C

ANSWER ALL THE QUESTIONS **(3 X 15 = 45M)**

9. A post-tensioned concrete beam simply supported over a span of 12m is of cross-section 230x750mm and is prestressed with 10 bars of 7mm diameter. The cable is parabolic with zero eccentricity at the support and 200mm at the mid-span. Calculate the total loss percentage for the following data:
   Grade of concrete = M40
   Initial Prestress = 1000N/mm^2
   Coefficient of curvature effect = 0.5
   k = 0.003/m
   Anchorage slip = 5mm
   Creep coefficient = 1.6
   Shrinkage of concrete = 0.0002
   Relaxation of stress in steel = 3%
   Es = 210kN/mm^2
   Ec = 37.5kN/mm^2

(CO2) [Application]

10. Find the ultimate flexural strength of a T-beam for the following data:
    Width of flange = 500mm
    Depth of flange = 100mm
    Depth of web = 425mm
    Width of web = 125mm
    Area of prestressing steel = 1900 mm^2
    Effective depth = 525mm
    Grade of concrete = M40
    Characteristic strength of steel = 1400N/mm^2

(CO3) [Application]

11. A post-tensioned simply-supported beam is 20m long. Using Fe415 steel reinforcement, design the beam for shear if the width is 100mm and overall depth is 250mm, Vu = 150kN, fck = 40N/mm2, effective cover = 50mm and uniform prestress is 5N/mm^2.

(CO3) [Application]