PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING
MID TERM EXAMINATION - APR 2023

Semester : Semester VI - 2020

Course Code : CIV3047

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

Program : CIV

Date : 17-APR-2023

Time : 11:30AM - 1PM

Max Marks : 60

Weightage : 30%

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   (2 X 5 = 10M)

1. Explain the process of chemical prestressing.

                                                (CO1) [Knowledge]

2. Explain the principle of post-tensioning system.

                                                (CO1) [Knowledge]

PART B

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

3. A rectangular concrete beam of cross section 50cm deep and 25cm wide is prestressed by means of 10 wires of 7mm diameter located 8.0cm from the bottom of the beam and 10 wires of diameter 7mm, 8cm from the top. Assuming the prestress in steel as 700Mpa, calculate the stresses at the extreme fibers of the mid-span section when the beam is supporting its own weight over a span of 6m, if a uniformly distributed LL of 6kN/m is imposed. The density of concrete is 24 kN/m^3.

                                                (CO1) [Comprehension]

4. A prestressed concrete beam of rectangular section 250mmx400mm is used over an effective span of 8m. It is subjected to a UDL of 6kN/m. The beam is prestressed by a straight cable carrying an effective prestressing force of 500kN and located at an eccentricity of 60mm. Determine and plot the location of pressure line.

                                                (CO1) [Comprehension]

5. Consider a rectangular prestressed beam 200mm wide and 400mm deep having an effective span of 8m. If the load were to counteract the bending effect of the prestressing force (neglect self-weight of beam), illustrate the effect of varied tendon profiles on the magnitude of load, by considering the following tendon profiles find the magnitude of the load Q for the following conditions:

a) The cable with zero eccentricity at the supports and linearly varying to 60mm at the centre, carries an effective prestressing force of 600kN

b) The cable with zero eccentricity at the supports and varying to 60 mm at the centre in a parabolic profile, carries an effective prestressing force of 600kN.

(CO1) [Comprehension]

PART C

ANSWER THE FOLLOWING QUESTION (1 X 20 = 20M)

6. A concrete beam, 120mm wide and 300mm deep, is prestressed by a straight cable carrying an effective force of 180kN at an eccentricity of 50mm. The beam spanning over 6m supports a total uniformly distributed load of 4kN/m which includes the self weight of the beam. The initial stress in the tendons is 1000 N/mm^2. Calculate the resultant stress distribution for the center-of-span cross section of beam and the percentage increase in stress in the tendons due to loading on the beam. Ec = 210 kN/mm^2 and Es = 35 kN/mm^2

(CO1) [Application]