Q.P. Code: 18CE1021 **R18**

Reg. No: | | | | | | | | | | |

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

M TECH II Year I Semester Supplementary Examinations November-2020

DESIGN OF PRESTRESSED CONCRETE STRUCTURES

(STRUCTURAL ENGINEERING)

Time: 3 hours Max. Marks: 60

(Answer all Five Units **5 x 12 = 60** Marks)

UNIT-I

1	**a**	What are the principles of prestressing in pretensioning and post tensioning.	**6M**
	b	What are the various states of loading stages to be considered in the design of prestressed concrete structures?	**6M**

OR

2	**a**	Differentiate between pretensioning and post tensioning systems? How is prestress Transmitted to the concrete in (i) pretensional members and (ii) post tensioned members	**6M**
	b	What are the general principals of prestressing? What are the advantages of using high Strength concrete and high strength steel?	**6M**

UNIT-II

3		A prestressed concrete beam 200mm wide and 300mm deep is prestressed with wires of area 320 mm^2 located at a constant eccentricity of 50 mm and carrying an initial stress of 1000 N/mm^2. The span of the beam is 10m. calculate the percentage loss of stress in the wires if the beam is (a) pretensioned and (b) post tensioned, using the following data: Es =210kN/mm^2 and Ec = 35 kN/mm^2; relaxation of steel stress = 5 percent of the initial stress; shrinkage of concrete = $300*10^{-6}$ for pretensioning and $200*10^{-6}$ for post tensioning; creep coefficient =1.6; slip at anchorage = 1 mm; frictional coefficient for wave effect = 0.00154 per m.	**12M**

OR

4		A post-tensioned concrete beam, 100mm wide and 300mm deep, is prestressed by three cables, each with a cross-sectional area $50mm^2$ and with an initial stress of $1200mm^2$. All the cables are straight and located 100mm from the soffit of the beam. If the modular ratio is 6, calculate the loss of stress in the three cables due to elastic deformation of concrete for the only the following cases. Simultaneous tensioning and anchoring of all three cables and successive tensioning of the three cables, one at a time.	**12M**

UNIT-III

5 A prestressed concrete I beam has its upper flange 750 mm wide and 200 mm deep, lower flange 400 mm wide and 300 mm deep and a web of depth 500 mm and width 150 mm. It is supported over a span of 30 meters and carries a uniformly distributed load of 4000 KN/m, exclusive of self-weight. It is prestressed with 120 wires of 5mm diameter, with their centroid 100mm the bottom wedge and Initially tensioned to 1000 N/mm^2. Assuming 15 percent loss in prestress, determine the extreme fiber stresses at mid span at various stages. Take density of concrete as 25 kN/m^3 **12M**

OR

6 A prestressed concrete beam of section 120mm wide by 300mm deep is used over Effective span of 6m to support a U.D.L of 4kN/m, which includes the self-weight of the beam. The beam is prestressed by a straight cable carrying a force of 180 kN and located at an eccentricity of 50mm. Determine the location of the thrust line in the beam and plot its position at quarter and central span sections. **12M**

UNIT-IV

7 **a** Write about importance of control of deflections and list the various factors influencing the deflection of prestressing concrete members. **6M**

b Write about short-term and long-term deflections of un-cracked members. **6M**

OR

8 A prestressed concrete beam span of 10m of rectangular section, 120mm wide and 300mm deep, is axially prestressed by a cable carrying an effective force of 180kN. The beam supports a total uniform distributed load of 5kN/m which includes the self-weight of beam. Compare the magnitude of the principal tension developed in the beam with and without the axial prestress. **12M**

UNIT-V

9 Design a non-cylindrical prestressed concrete pipe of 600mm internal diameter to withstand a working hydrostatic pressure of 1.05N/mm^2, using a 2.5mm high-tensile wire stressed to 1000N/mm^2 at transfer. Permissible maximum and minimum stresses in concrete at transfer and service loads are 14 and 0.7N/mm^2.The loss ratio is 0.8. Calculate also the test pressure required to produce a tensile stress of 0.7N/mm^2 in concrete when applied immediately after tensioning and also the winding stress in steel if E_s=210KN/mm^2 and E_c=35KN/mm^2 **12M**

OR

10 A prestressed concrete circular cylindrical tank is required to store 24500 million liters of water. The permissible compressive stress in concrete at transfer should not exceed 13N/mm^2 and the minimum compressive stress under working pressure should not be less than 1N/mm^2. Te loss ratio is 0.75. High-tensile steel wires of 7mm diameter with an initial stress of 1000N/mm^2 are available for winding round the tank. Freyssinet cables of 12 wires of 8mm diameter which are stressed to 1200N/mm^2 are available for vertical prestressing. The cube strength of concrete is 40N/mm^2. Design the tank walls supported on elastometric pads. Assume the coefficient of friction as 0.5. **12M**

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