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

Question Paper Code: U1104

B.E. / B.Tech DEGREE EXAMINATION, NOV 2024

Professional Elective

Civil Engineering

21CEV104- PRESTRESSED CONCRETE STRUCTURES

(Regulations 2021)

Duration: Three hours | Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1.	What is anchorage?	CO1-U
2.	What are post tensioning anchorages?	CO1-U
3.	What are the advantages of partial prestressing?	CO1-U
4.	Enlist the types of Flexural Failure.	CO1-U
5.	What is meant by end block in Post tensioned member	CO1-U
6.	Write the function of End blocks.	CO1-U
7.	Define propped construction.	CO1-U
8.	Define stress at transfer.	CO1-U
9.	What are the types of prestressed concrete pipes?	CO1-U
10.	Define circular prestressing.	CO1-U

PART – B (5 x 16= 80 Marks)

11.	(a)	A rectangular concrete beam 100 mm wide by 250 deep, spanning over 8m is prestressed by a straight cable carrying an effective prestressing force of 250 KN located at an eccentricity of 40mm.The beam supports a live load of 1.2kN/m. (a) Calculate the resultant stress distribution for the central cross section of the beam. The density of concrete is 24kN/m^3. (b) Find the magnitude of the prestressing force with an eccentricity of 40 mm which can balance the stresses due to dead and live loads at the bottom of the central section of the beam.	CO2 App	(16)

Or

(b) A prestressed concrete beam supports an imposed load of 4kN/m over an effective span of 10m. The beam has a rectangular section with width of 200mm and depth of 600mm. Find the effective prestressing force in the cable, if it is parabolic with an eccentricity of 100mm at center and zero at the ends for the following conditions.
(a) If the bending effect of prestressing force is nullified by the imposed load for the mid-span section (neglecting the self-weight of the beam)
(b) The resultant stress due to self-weight, imposed load and prestressing force is zero at the soffit of the beam for the mid-span section. Assume density of concrete=24kN/m^3. CO2 App (16)

12. (a) Explain various types of flexural failures in prestressed concrete structures. CO1 U (16)

Or

(b) Write the recommendations for Design for shear based on I.S. 1343 Code. CO1 U (16)

13. (a) A concrete beam with a cross sectional area of 32 X 10^3 mm^2 and radius of gyration of 72 mm is prestressed by a parabolic cable carrying an effective stress of 1000 N/mm^2.The span of beam is 8m.The cable composed of 6wires of 7mm diameter has an eccentricity of 50mm at the center and zero at the supports. Neglecting all losses, find the central deflection of the beam as follows:
a) self-weight + Prestress.
b) self-weight + Prestress + Live load of 2KN/m.
Assume E = 38KN/mm^2 , D_c = 24KN/m^3. CO2 App (16)

Or

(b) The end block of Post tensioned PSC beam 300mm wide and 300mm deep is subjected to a concentric anchorage force of 800KN by a freyssinet anchorage system of area 11000mm^2.Design and detail the average reinforcement for the end block. CO2 App (16)

14. (a) A precast pre – tensioned beam of rectangular section has a breadth of 100mm and depth of 200mm. The beam with an effective span of 5m is prestressed by the tendons with their centroids coinciding with the bottom kern. The initial force in the tendons is 150kN. The loss of prestress is 15%. The top flange width is 400mm with the thickness of 40mm.If the composite beam supports a live load of 8kN/m^2. Calculate the resultant stresses developed if the section is propped and unpropped. Assume same modulus of elasticity in precast beam and in situ slab. CO4 Ana (16)

Or

(b) A composite T beam is made up of pre – tensioned rib of 100mm wide and 200mm deep and a cast in situ slab of 400mm wide and 40mm thick. Having the modulus of elasticity as 28 kN/mm^2 , if the differential shrinkage is 100 x 10^{-6} determine the shrinkage stresses developed in precast and cast in situ units. CO4 Ana (16)

15. (a) A prestressed concrete pipes is to be designed to withstand a fluid pressure of 1.7 N/mm^2.The diameter of the pipe is 1300mm and shell thickness is 100mm.The max compressive stress in concrete at transfer is 16N/mm^2.A residual compression of 1N/mm^2 is expected to be maintained at service loads. Loss ratio is 0.8 high tensile wires of 5mm diameter. Analyse the spacing of wire winding for various initial stress i)The number of turns of wires per meter length.
ii)The pitch of wire winding for initially stressed to 1kN/mm^2& 5 KN/mm^2. CO5 Ana (16)

Or

(b) A cylindrical PSC water tank of internal diameter 35 m is required to store water over a depth of 7.5m. Circumferential winding is made of 5mm diameter wires with initial stress of 1000 N/mm^2. Vertical prestressing is made using freyssinet cable of 12 wires of 8mm diameter stressed to 1200 N/mm^2.The loss ratio is 0.75. fmin= 1 N/mm^2, fct = 13 N/mm^2 and fc= 40 N/mm^2.Analyzing the stresses encountered in PSC tanks and also estimate the spacing of wires in water tank by assuming base is fixed . CO5 Ana (16)