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Question Paper Code: 95U21

M.E. DEGREE EXAMINATION, MAY 2022

Elective

19PSE521 - DESIGN OF PRESTRESSED CONCRETE STRUCTURES

(Regulation 2019)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 20 = 100 Marks)

11. (a) A pretensioned T- section has a flange 1200 mm wide and 1500 mm thick. The width and depth of the rib are 300 mm and 1500 mm respectively. The high tensile steel has an area of 4700 mm^2 and is located at an effective depth of 1600 mm. If the characteristic cube strength of the concrete and tensile strength of steel are 40 N/mm^2 and 1600 N/mm^2 , Calculate the flexural strength of the T section. Friction coefficient for wave effect = 0.0017 per m
- CO1-App (20)

Or

- (b) The support section of a prestressed concrete beam 100 mm wide and 250 mm deep is required to support an ultimate shear force of 60 kN. The compressive prestress at the centroidal axis is 5 N/mm^2 . The characteristic compressive strength of concrete is 40 N/mm^2 . The cover to the tension reinforcement is 50 mm. If the characteristic tensile strength of steel in stirrups is 250 N/mm^2 , design suitable reinforcement at the section using IS 1343 recommendations.
- CO1- App (20)

12. (a) A pretensioned T- section has a flange 1200 mm wide and 1500 mm thick. The width and depth of the rib are 300 mm and 1500 mm respectively. The high tensile steel has an area of 4700 mm^2 and is located at an effective depth of 1600 mm. If the characteristic cube strength of the concrete and tensile strength of steel are 40 N/mm^2 and 1600 N/mm^2 , Calculate the flexural strength of the T section.
- CO2- App (20)

Or

- (b) Explain with sketches the IS1343:2012 code method of computing the moment of resistance of rectangular sections CO2- App (20)
13. (a) What are the advantages of continuous members in prestressed concrete structures CO3- U (20)
- Or
- (b) List the commonly used method to analyse secondary moments in prestressed concrete continuous structures CO3- App (20)
14. (a) Design a cylindrical prestressed concrete water tank to suit the following data: Capacity of tank = 24500 x 106liters. Maximum compressive stress in concrete at transfer not to exceed 13 N/mm²(compression). Minimum compressive stress under working load to be 1 N/mm². The prestress is to be provided by circumferential winding of 7 mm dia with an initial stress of 1000 N/mm²and by vertical cables of 12 wires of 8 mm diameter which are stressed to 1200 N/mm². Loss ratio = 0.75. The cube strength of concrete is 40 N/mm². Design the walls of the tank and details of circumferential wire winding and vertical cables for the following joint condition at the base: elastomeric pads (assume coefficient of friction as 0.5) CO4- App (20)
- Or
- (b) A non-cylinder prestressed concrete pipe of 1.6 m diameter with a core thickness of 100mm is required to withstand a working pressure of 1N/mm². Determine the pitch of a 5mm diameter wire winding if the high tensile initial stress in the wire is limited to 1000N/mm². The permissible maximum and minimum stresses in concrete are 12 N/mm² (compression) and zero (tension). The loss ratio is if the direct tensile stress of concrete is 2 N/mm² estimate the load factor against cracking. CO4- App (20)

15. (a) Briefly explain the necessity of using composite section in PSC structures. Also discuss about the shear in composite beams. What are the provisions usually made to counteract the effects. CO5- App (20)

Or

- (b) A composite T-girder of span 7m is made up of a pre-tensioned rib, 100mm wide by 150mm depth, with an insitu cast slab, 450mm wide and 45mm thick. The rib is prestressed by a straight cable having an eccentricity of 40 mm and carrying initial force of 170kN. The loss of prestress is 20%. Check the composite T-beam for the limit state of deflection if its supports an imposed load of 4.5kN/m for (i) unpropped (ii) propped. Assume modulus of Elasticity of 35kN/mm^2 for both precast & insitu cast elements. CO5- App (20)

