



Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)



II SEM M.Tech. STURCTURAL ENGINEERING

END SEMESTER EXAMINATIONS, MAY 2016

SUBJECT: ADVANCED PRESTRESSED CONCRETE (CIE-544)

REVISED CREDIT SYSTEM

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer any FOUR FULL questions
- Use of IS:1343-2012, IS:784-2001,IS:784-1985 and Authorized Design Aid are permitted
- ✤ Any Missing data may suitably assumed

| 1. | Design a simply supported prestressed post-tensioned (type1) slab for the following data. Effective span = 8 m, grade of concrete = M50, Live load = 2 kN/mm^2 . FL = 1.5 kN/m^2 , grade of high strength wire, $f_{pk} = 1470 \text{ MPa}$ (7 mm diameter). Compute stresses at various stages. Check for shear and deflection. | 12.5 |
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| 2. | A composite tee beam is made up of a pre-tensioned rib 250 mm thick and 750 mm deep and a cast-in-situ slab of 150 mm thickness and 800 mm width. The beam is simply supported over a of span 12 m to support an imposed load of 15 kN/m. Assume grade 40 concrete in precast web and slab and fpk = 1570 MPa. Loss in cable as 20%. Design the composite section and shear connections. Compute stresses in the section at various stages. The precast member is unpropped during the casting of the CIP portion. | 12.5 |
| 3. | A PSC Portal Frame ABCD has column $AB = DC = 4$ m and beam $BC = 9$ m. The ends of the columns are fixed at A and D. The beam carries super imposed load of 15 kN/m. Cross section of beam and column is 300 mm X 650 mm. Design the frame using M-45 grade concrete. Draw maximum and minimum eccentricity at different locations along the beam and the column. Compute stresses in the critical section at various stages. | 12.5 |
| 4. | A non-cylindrical pre-stressed concrete pipe of internal diameter 900 mm and length 3 m, is required to with stand a working pressure of 1.2 N/mm ² . Design pipe thickness, and longitudinal and circumferential pre-stressing forces and spacing of wiers. Assume circumferential winding by the process of counter weight/break. Use high tensile wire of 3 mm diameter ultimate strength 1765 N/mm ² and M-40 grade | 12.5 |

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| | concrete. Assume minimum compressive stress under working load to be 1.0 N/mm ² . Check only the longitudinal stresses for permissible values as per IS 784:2001. Assume coat thickness as 25 mm. | |
| 5. | Design post tensioned bonded PSC simply supported I-beam to carry a live load of 21 kN/m over a span of 10m. Grade of Concrete: M-45; Characteristic Strength of Steel: 1500 N/mm ² ; Loss of prestress: 20% ; Cable profile: Parabolic which is concentric at supports and having an eccentricity at mid span. Effective cover to longitudinal reinforcement: 75mm. (a) Compute stresses in the critical section at various stages, (b) Check for limit state of collapse in flexure, (c) Design the Shear reinforcement, (d) Check for serviceability limits of deflection according to I.S.1343-2012. | 12.5 |