Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

II SEMESTER M.TECH. (STRUCTURAL ENGINEERING)

END SEMESTER EXAMINATIONS, APRIL/MAY 2019

SUBJECT: **ADVANCED PRESTRESSED CONCRETE [CIE 5252]**

REVISED CREDIT SYSTEM
(26/04/2019)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- **Missing data may be suitable assumed.**
- *Use of IS:1343-2012, IS:784-2001, Authorized Design Aid are permitted*

1	Design a Post-tensioned rectangular Type-2 PSC simply supported beam of span 23 m to carry LL = 9 kN/m. Assume M-50 grade concrete. Tensile strength of concrete is 1.7 N/mm^2. Beam is pre-stressed using 8 mm diameter high tensile steel wires having characteristic strength of 1100 N/mm^2. The strength of concrete at transfer can be taken as 0.7f_{ck}. Long term loss of pre-stress is 15%. Sketch the suitable parabolic cable profile. Check the critical sections for permissible stresses. Compute ultimate load carrying capacity at critical section. Calculate long term deflection	**10**	**CO1**
2.	Design a Post-tensioned Type-I PSC continuous rectangular beam of two equal span, AB = 15 m and BC = 15 m to carry a live load of 18 kN/m. Take M-45 grade concrete and pre-stressing wire of diameter 9.5 mm 7-ply strand of nominal c/s area of 51.6 mm^2 having characteristic strength of 1465 N/mm^2. Take strength of concrete at transfer as 0.7f_{ck}, and pre-stress in strand after transfer 970 N/mm^2. Assume 15% loss at service. Check the section at mid-support for permissible stresses.	**10**	**CO2**
3.	A composite tee beam is made up of a pre-tensioned rib 300 mm thick and 800 mm deep and a cast-in-situ slab of 180 mm thickness and 1600 mm width. The beam is simply supported over a of span 18 m to support an imposed load of 12 kN/m. Assume grade 40 concrete in precast web and slab and high strength wire of fpk = 1500 MPa. Assume long term loss in cable as 15%. Design the composite section and shear connections. Compute stresses at the critical section at various stages. The precast member is unpropped during the casting of the slab.	**10**	**CO4**

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4.	Design a simply supported pre-stressed post-tensioned (type1) slab for the following data. Effective span = 7 m, grade of concrete = M40, Live load = 2 kN/mm^2. Floor finish = 1.5 kN/m^2, grade of high strength wire, f_{pk} = 1470 MPa (7 mm diameter). Assume long term losses as 15%. Check for deflection using creep coefficient of 1.6.	**10**	**CO4**
5.	A non-cylindrical pre-stressed concrete pipe of internal diameter 1200 mm and length 5 m, is required to with stand a working pressure of 1.5 N/mm^2. Design pipe thickness, and longitudinal and circumferential pre-stressing forces, spacing of wires. Assume circumferential winding by the process of counter weight/break. Use high tensile wire of 5 mm diameter with ultimate strength 1570 N/mm^2 and M-40 grade concrete. Assume: i) minimum compressive stress under working load to be 1.0 N/mm^2, ii) coat thickness as 25 mm, iii) strength of concrete at winding 30 MPa and at detensioning longitudinal 20 MPa, iv) bedding angle = 120^0 & θ = 180^0. Check for circumferential stresses for factory test condition for permissible values.	**10**	**CO3**