Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL

(A constituent institution of MAHE, Manipal)

II SEMESTER M.TECH. (STRUCTURAL ENGINEERING)
END SEMESTER EXAMINATIONS, APRIL/MAY 2018

SUBJECT: ADVANCED PRESTRESSED CONCRETE [CIE 5252]
REVISED CREDIT SYSTEM

(19/ 04/ 2018)

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

1A.	A two span continuous bridge girder is post-tensioned with a tendon consisting of twenty strands with fpk =1860 MPa. The profile of the tendon is as shown in Fig.Q1A. The tendon is stressed up to 76% fpk from one end and then anchored. The tendon properties are Ap = 2800 mm^2, Ep = 195,000 MPa, μ = 0.20, K = 0.0020/ m. Calculate the expected elongation of the tendon after stretching and the value of prestressing force after anchorage slip of 6mm.	**4**
1B.	A bonded post-tensioned concrete beam has flanged section: top flange 450 x 200 mm, bottom flange 300 x 250 (depth) mm, web 150 x 600 depth mm. The beam is pre-stressed by tendons of area 1750 mm^2, located at 125 mm from the soffit (bottom surface) with an effective pre-stress of 1100 MPa. Tensile strength of tendon, fpk 11860 MPa. Grade of concrete is M60. Estimate the ultimate flexural strength by the method of IS 1343- 2012.	**6**
2.	A continuous prestressed-concrete rectangular beam 350mm x 1000 mm with bonded tendon is as shown in Fig.Q2. Locate the pressure line in the concrete due to prestress alone, not considering the dead load of the beam. Consider a prestress of 1112 kN. Also calculate the stresses in the concrete at mid-support section & mid-span BC with considering the dead load of the beam.	**10**
3.	A Composite tee beam is made up of a pre-tensioned rib 300mm thick and 900mm deep and a cast-in-situ slab of 150 mm thickness and 1200 mm width. The beam is simply supported over a span of 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 = 1470 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 CIP portion.	**10**
4.	Design suitable cable profile for a PSC Portal Frame ABCD having column AB = DC = 5m and beam BC = 12 m. The ends of the columns are fixed at A and D. The beam carries super imposed load of 18 kN/m. Assume same cross section 300 mm X 800 mm for both beam & column, M-45 grade concrete and strand with fpk, 1860 MPa. Calculate stresses in the beam at mid-section at service.	**10**

5.	A non-cylindrical pre-stressed concrete pipe of internal diameter 1200 mm and length 5m, is required to with stand a working pressure of 1.6 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 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 20MPa, iv) bedding angle = 120° & θ = 180°. Density of earth fill 18 kN/m^3. Height of fill = 1 m. take Ct = 0.50. Calculate for the following circumferential pre-stressing requirement, i) circumferential prestressing condition (self weight + initial prestressing ii) site test condition (site etst pressure +self weight+ weight of water+earth fill + final prestress)	**10**

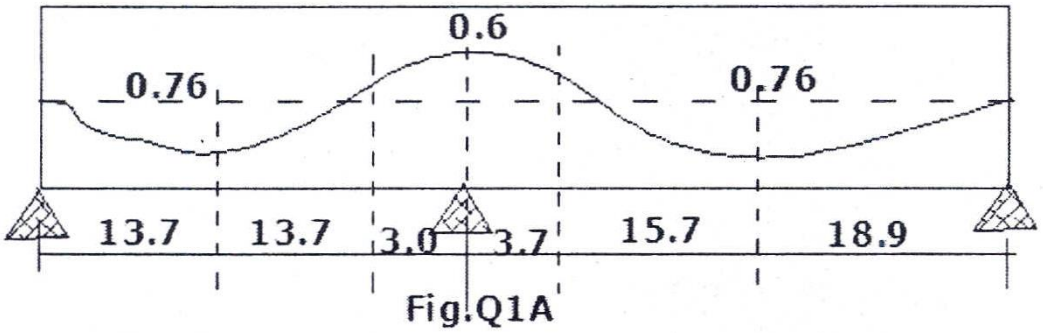

Fig.Q1A

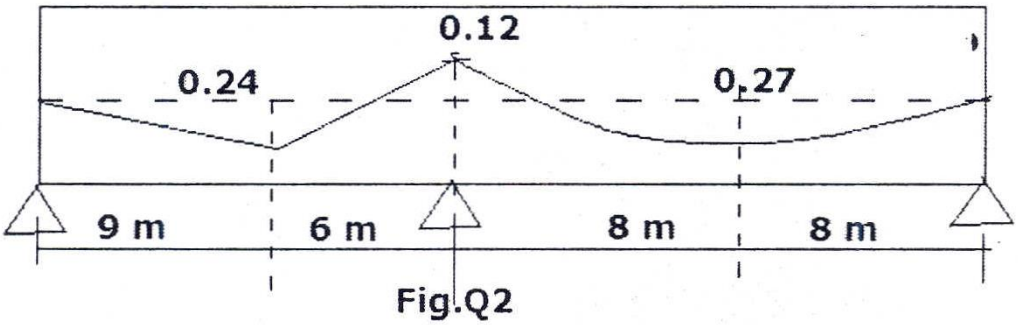

Fig.Q2