Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VII SEMESTER B.TECH. END SEMESTER EXAMINATIONS

DECEMBER - 2019

SUBJECT: PRESTRESSED CONCRETE DESIGN

[CIE 4016]

Date of Exam: 02/01/2020 Time of Exam: Max. Marks: **50**

- ❖ Answer ALL the questions & missing data may be suitably assumed
- ❖ Use of IS: 1343-2012 is permitted
- ❖ Assume density of concrete as 25kN/m^3

❖

1A.	Prestressed concrete members will have relatively higher stiffness than corresponding RCC members. Substantiate with reasons.	**(03)**	**CO1**
1B.	A PSC post-tensioned beam of span 10m is pre-stressed with wires of total area 350mm^2.If all wires have parabolic profile with zero eccentricity at ends and an eccentricity of 50mm at mid span and if each are carrying an initial pre-stress of 1000N/mm^2 , if all wires are tensioned simultaneously from one end. (a) Compute the total percentage of loss of pre-stress with the following data: E_S=200kN/mm^2, M50 concrete ; Shrinkage Strain=3X10^{-4}; Φ=1.6; Relaxation of Steel=6%; Stress in concrete at the level of cable= 6N/mm^2 ; Δ=1mm, k=0.0015/m, μ=0.35.	**(07)**	**CO2**
2A.	Check for the limit state of collapse in flexure for simply supported post-tensioned beam of span 13m loaded with a working load of 17kN/m. The beam is pre-stressed by 15 numbers indented wires of 5mm diameter whose characteristic strength is 1800N/mm^2. The effective cover to the centroid of pre-stressing steel is 275mm. The grade of concrete is M40. The section is as given in **table 1**.	**(06)**	**CO3**
2B.	A simply supported beam of span 12m carries two concentrated loads of 80kN each at one third span points. The beam is rectangular in section of 360mm×720mm. Assume the pre-stressing force in the cable to be 1000kN, sketch suitable cable profiles of two cables, to balance self-weight and external loads.	**(04)**	**CO1**
3A.	Design the shear reinforcement for a simply supported PSC beam of span 8m loaded with 10kN/m which is pre-stressed with an effective pre-stressing force of 750kN with a parabolic cable having maximum eccentricity of 220mm at mid span. The shear resistance at a section which is cracked in flexure is 90kN. The grade of concrete is M40 and the section is as in **table 1**.	**(07)**	**CO3**
3B.	If the beam given in **Q. No. 2A** is pre-tensioned, check for the development length and design the end zone reinforcement, if effective pre-stress is 0.6f_p and f_{pu} = 1500N/mm^2.	**(03)**	**CO5**
4A.	A PSC beam has span of 8m. It is having a rectangular cross section of breadth 400mm and depth 600mm. It is pre-stressed with an initial pre-stressing force of 500KN. The loss of pre-stress is 20% of initial pre-stress. The cable provided has zero eccentricity at the support section and linearly increases to 100mm at mid-section. M-35 grade concrete is used for casting the beam. If a point load of 500KN is applied at the mid span. Take Φ = 1.5. 1. Check for serviceability limits according to I.S.1343 specifications.	**(06)**	**CO4**

	2. If final deflection is above serviceability limit, what should be the minimum external load that can be applied on beam if deflection should be restricted within the limits.		
4B.	Explain design steps to control failure due to bearing Post-tensioned beams.	**(04)**	**CO5**
5	Design a simply supported type-1 post-tensioned PSC beam of span 11m loaded with a working load of 16kN/m. Take initial value of pre stressing force as 900kN, take M40 grade concrete, Characteristic strength of HTS wires used for tendon is 1600 N/mm^2 and trial cross-section as in **table 1.** Loss of pre-stress is 15%.	**(10)**	**CO3**

TABLE: 1

Top flange	410mm × 150mm
Web	140mm × 620mm
Bottom flange	200mm × 250mm
y_t	450.28mm
I	2.17×10^{10} mm^4