Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VII SEMESTER B.TECH.

END SEMESTER EXAMINATIONS, MAY 2019

SUBJECT: PRESTRESSED CONCRETE DESIGN [CIE 4016]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Use of **IS 1343-1980, 2012** are allowed.
- Missing data may be suitably assumed.

1A.	List the reasons for higher Shear resistance of PSC members as compared to corresponding RCC members.	**03**	**CO3**
1B.	A PSC pretensioned beam of span 9m is pre-stressed HTS bars of total area 500mm^2.If all bars have linearly varying cable profile with zero eccentricity at ends and an eccentricity of 100mm at mid span. Initial prestress induced in bars is 675 N/mm^2 . Compute losses of pre-stress and total percentage of loss.Use following data: Steel: HTS bars ; Concrete M50 grade; Age of loading- 28 days; Characteristic strength of steel f_p = 900 N/mm^2 ; Area of Cross section 120 X 10^3 mm^2; Moment of Inertia of cross section 10 X 10^{10} mm^4	**07**	**CO1**
2A.	A double overhanging beam has left and right overhanging spans of 2m and middle supported span is 6m. Over hanging spans and supporte spans are loaded with an UDL of 11 kN/m.. Sketch the cable profile for the beam.	**03**	**CO1**
2B.	A un symmetrical 'I' section of Pretensioned PSC beam was designed for a single span bridge girder spanning 12m. Sectional properties are given in **Table 1**. Below. M40 grade of concrete is used with an f_{ci} of 28 N/mm^2 . The beam is partially prestressed. The cable is parabolic with zero eccentricity at supports, and 200mm eccentricity at midspan. The beam carries an UDL of 16kN/m throughout the span. The prestressing force in tendons is 850kN and loss of prestress is 19%. Draw the stress distribution diagram at transfer and working stage and check for permissible limits as per IS 1343-2012	**07**	**CO2**
3A.	Check for the limit state of collapse for simply supported pretensioned beam of span 11.5m loaded with a working load of 14.75kN/m. The beam is pre-stressed by 30 indented wires of 5mm diameter whose characteristic strength is 1600N/mm^2. The effective cover to the centroid of pre-stressing steel is 275mm. The grade of concrete is M45. The sectional properties are as given in **Table-1**.	**08**	**CO3**
3B.	A prestressed beam is designed for a live load of 12.5 kN/m over span of span of 13m. The grade of concrete used is M45 and initial prestress induced is 800 kN with a loss of 20%. A parbolic cable which is concentric at supports and having maximum eccentricity of 260mm at mid span is provided as tendon. Designed section is as given in **Table-1**. If coefficient of creep is 1.6, check for limit state serviceability in long term deflection according IS 1343-2012.	**02**	**CO2**

4A.	The End block of post tensioned beam has cross section 500mm × 500mm is prestressed with an effective prestress of 750kN. Two anchor plates having dimension 100mm × 90mm are placed with their centroid at 250 mm from vertical edge and 120 mm from top & bottom edge respectively at the end face. M45 grade of concrete with 30N/mm^2 strength at transfer is used for the beam. Design End block reinforcement using HYSD steel.	**04**	**CO3**
4B.	A PSC beam having sectional properties as in **Table-1** is pre-stressed using parabolic cable which is having zero eccentricity at supports and 250mm below cgc at mid span. The beam is simply supported over a span of 10m and carries a super imposed load of 15 kN/m over the whole span. M40 grade concrete is used for the beam and is prestressed with an effective prestress of 900 kN. Shear resistance at section cracked in flexure is 100 kN. Check limit state of collapse in shear according to IS1343-2012 and design the shear reinforcement if required.	**06**	**CO3**
5.	Design a simply supported type-1 post-tensioned PSC beam of span 11.25 m loaded with a working load of 12.5 kN/m. Grade of concrete used is M40 with an initial strength of 28 N/mm^2 . Assume loss of prestress as 19%. Take Trial cross-section as given in **Table-1.**	**10**	**CO3**

Table- 1

Top flange	450mm × 100mm
Web	100mm × 775mm
Bottom flange	150mm × 175mm
y_t	438.97mm
A	149 X 10^3 mm^2
I	1.82×10^{10} mm^4