Q. Code: 704465

Reg. No. | | | | | | | | | |

B.E. / B.TECH. DEGREE EXAMINATIONS, DEC 2019

Seventh Semester

CE16702 – PRESTRESSED CONCRETE STRUCTURES

(Civil Engineering)

(Regulation 2016)

Time: Three Hours **Maximum : 100 Marks**

(*IS 1343, IS3370 are allowed. Assume data wherever necessary*)

Answer **ALL** questions

PART A - (10 X 2 = 20 Marks)

		CO	RBT
1.	What are the applications of post tensioning?	1	R
2.	List the losses of pre-stress.	1	R
3.	What are the various types of flexural failures encountered in pre-stressed concrete members?	2	R
4.	State the difference in load carrying mechanism in flexure under working condition between RCC and PSC.	2	U
5.	Define the term end block.	3	R
6.	What are the factors influencing deflections?	3	R
7.	What is the difference between propped and unpropped composite construction?	4	R
8.	How is continuity achieved in prestressed concrete continuous beams?	4	U
9.	Define partial pre-stressing.	5	R
10.	Define circular pre-stressing.	5	R

PART B - (5 X16 = 80 Marks)

11.	(a)	A rectangular concrete beam of cross-section 30 cm deep and 20 cm wide is prestressed by means of 15 wires of 5mm diameter located 6.5 cm from the bottom of the beam and 3 wires of diameter of 5 mm, 2.5 cm from the top. Assuming the prestress in the steel as 840 N/mm^2, calculate the stresses at the extreme fibres of the midspan section when the beam is supporting its own weight over a span of 6 m. If a uniformly distributed live load of 6 kN/m is	**(16)**	1	AN

imposed, evaluate the maximum working stress in concrete. The density of concrete is 24 kN/m^3.

(OR)

	(b)	A prestressed concrete beam, 200 mm wide and 300 mm deep, is prestressed with wires (area = 320 mm^2) located at a constant eccentricity of 50 mm and carrying an initial stress of 1000 N/mm^2. The span of the beam is 10 m. Calculate the percentage loss of stress in wires if (i) the beam is pre-tensioned and (ii) the beam is post-tensioned, using the following data: E_s = 210 kN/mm^2 and E_c = 35 kN/mm^2; relaxation of stress in steel = 5 percent of the initial stress; shrinkage of concrete = 300 x 10^{-6} for pretensioning and 200 x 10^{-6} for post tensioning; creep coefficient = 1.6; slip at anchorage = 1 mm; frictional coefficient for wave effect = 0.0015 per m.	**(16)**	**1**	**AN**
12.	(a)	Explain in detail about layout of wires and cables in pre tensioned and post tensioned member.	**(16)**	**2**	**U**

(OR)

	(b)	A precast pretensioned T beam has a flange width of 1200 mm and thickness of 150 mm. The width and depth of the rib are 300 and 1500 mm respectively. The high tensile steel tendons of cross sectional area 4700 mm^2 are located at an effective depth of 1600 mm. If the characteristic strength of concrete and steel are 40 and 1600 N/mm^2 respectively, calculate the flexural strength of the T section using Indian Standard Code provisions.	**(16)**	**2**	**AN**
13.	(a)	A post tensioned concrete beam 400 mm wide and 800 mm deep is prestressed by an effective prestressing force of 1100 kN at an eccentricity of 120 mm. The anchor plate is 400 mm wide and 400 mm deep. Calculate the bursting force and design reinforcement to resist this force.	**(16)**	**3**	**AN**

(OR)

	(b)	A concrete beam having a rectangular section 100 mm wide and 300 mm deep is prestressed by a parabolic cable carrying an initial force of 240 kN. The cable has an eccentricity of 50 mm at the centre of span and is concentric at the supports. If the span of the beam is 10 m and the live load is 2 kN/m, estimate the short time deflection at the centre of span. Assuming E = 38 kN/mm^2 and creep coefficient f = 2.0, loss of prestress = 20 percent of the initial stress after 6 months. Estimate the long time deflection at the centre of span at this stage, assuming that the dead and live loads are simultaneously applied after the release of prestress.	**(16)**	**3**	**AN**
14.	(a)	A composite beam consists of 120 mm x 240 mm precast stem and a cast in situ flange 480 mm x 50 mm. The span of the beam is 6 m. The stem is a post-tensioned unit which is subjected to an initial prestressing force of 230 kN. The loss of prestress is 15 %. The tendons are provided such that their center of gravity is 80 mm above the soffit. The beam has to support a live load of 4 kN/m. Determine the resultant stresses in the stem and flange, if the beam is (i) unpropped and (ii) propped.	**(16)**	**4**	**AN**
		(OR)			
	(b)	A continuous beam of two equal spans of 30 m each has a rectangular section, 500 mm wide and 1000 mm deep throughout the spans. The beam is prestressed by concordant cable having high tensile strands on cross sectional area 3000 mmm^2, 100 mm from the top of the beam at mid support section. If the beam supports an uniformly distributed service load of 8kN/m throughout the span lengths, estimate the load factor against failure. Given f_{pu} = 1700 N/mm^2, f_{ck} = 50 N/mm^2 and density of concrete as 24 kN/m^3, estimate the load factor against failure assuming a. elastic distribution of moments and b. complete redistribution of moments.	**(16)**	**4**	**AN**
15.	(a)	A prestressed concrete tank wall is subjected to a hoop tension of 1 kN/mm due to water pressure. The maximum and minimum	**(16)**	**5**	**AN**

permissible compressive stress in concrete under working pressure is 13 N/mm^2 and 1 N/mm^2 respectively. The loss of prestress due to various causes may be taken as 25%. High tensile wires of 5 mm diameter with an initial stress of 1000 N/mm^2 are available for circumferential wire winding. Design suitable thickness for the tank walls and the spacing of circumferential wire winding. Assume the diameter of the tank as 30 m and height of water in tank as 7.5 m.

(OR)

(b) A pre-tensioned prestressed concrete pole is to be designed to suit the following data: **(16) 5 AN**

Height of the pole above ground = 10 m, wind force on wires acting at a height of 8 m from base = 2 kN, wind force on pole = 1.6 kN, permissible compressive stress in concrete = 16 N/mm^2, loss ratio = 0.8. No tension is permitted under working loads. High tensile wires of 8 mm diameter initially stressed to 1200 N/mm^2 are available for use. Design a suitable section for the pole at base and the number of wires required in the pole.