CV701

USN	1	M	S							

M S RAMAIAH INSTITUTE OF TECHNOLOGY

(AUTONOMOUS INSTITUTE, AFFILIATED TO VTU)
BANGALORE – 560 054

SEMESTER END EXAMINATIONS – JANUARY 2016

Course & Branch	:	**B.E.- Civil Engineering**	**Semester**	:	**VII**
Subject	:	**Design of Pre Stressed Concrete Structures**	**Max. Marks**	:	**100**
Subject Code	:	**CV701**	**Duration**	:	**3 Hrs**

Instructions to the Candidates:

- Answer ***one*** full question from each unit.
- Use of IS 1343 is permitted.
- Any data missing can be assumed suitably.

UNIT – I

1. a) Differentiate between Pre-tensioning and post-tensioning systems, and list the various post-tensioning systems — CO1 — (06)

   b) A concrete beam of symmetrical I-section spanning 8m has the width and thickness of flanges = 200mm and 60 mm respectively. The overall depth of the beam is 400MM. The thickness of the web is 80mm. The beam Is pre-stressed by a parabolic cable with an eccentricity of 150mm at the center and zero at supports with an effective force of 100 KN. The live load on the beam is 2KN/m. Draw the stress distribution diagram at the central section — CO1 — (14)

   a) Pre-stress + self-weight (density of concrete = 24 KN/m^3).

   b) Pre-stress + self-weight + live load.

2. a) Explain the concept of thrust line and obtain equation to calculate stresses in PSC beam. — CO1 — (06)

   b) A concrete beam with "double overhang" has the middle-span equal to 10m and the equal over hanging on either side is 2.5m . Determine the profile of the pre-stressing cables with an effective force of 250 KN which can balance the u.d.l of 8KN/m on the beam. Sketch the cable profile marking the eccentricity of the cable at the support and mid span — CO1 — (14)

UNIT – II

3. a) What are short term and long term deflection? — CO2 — (06)

   b) A PSC beam 250mm wide and 400 mm deep is pre-stressed with wires of area 400 mm^2 located at constant eccentricity of 50mm. The initial stress in wires is 100 N/mm^2. The beam is simply supported over a span of 12 m. Calculate the losses in wires if beam is post-tensioned. — CO2 — (14)

   E_s = 210KN/mm^2, E_c = 35KN/mm^2, Relaxation of steel stress = 5% of initial stress , Shrinkage of concrete = 0.00025 (ϵ_{cs}), Creep co-efficient = 1.6 (Φ), Slip at anchorage = 2mm (Δ), Frictional co-efficient for wave effect = 0.0015/m (k)

4.	a)	List out and explain the various factors influencing the loss of pre-stress in post-tensioned member.	CO2	(06)
	b)	A psc beam 125mm wide & 250mm deep is pre-stressed with 10 wires of 7mm diameter with an initial pre-stress of 800N/mm^2. The wires are housed in a duct of 25mm x 50mm with its center located at 75mm from the soffit. The span of the beam is 6m and has to support a live load of 5KN/m. Estimate the max deflection at service condition when the beam is 1) grouted and 2) ungrouted.	CO2	(14)

UNIT – III

5.	a)	Write briefly the modes of fracture due to shear.	CO3	(06)
	b)	A pre-tensioned concrete tee-section having a flange width of 1200mm and thickness of flange 150mm, thickness of web being 300mm is pre-stressed by 4700mm^2 area cable located at an effective depth of 1600mm.If f_{ck}=40mpa and f_p=1000mpa. Estimate the ultimate moment capacity of the pre-tensioned tee-section.	CO3	(14)
6.	a)	Write the procedure to find ultimate moment of resistance for T or I sections by IS code method.	CO3	(06)
	b)	A PSC beam 250mm wide and 1500mm deep carries an effective pre-stressing force of 1362 kN. Shear force at a section under working load is 771KN. Effective pre-stress at the function is taken to be acting at an angle of $\sin^{-1}$ 1/6 with horizontal. The extreme fibre stress is 7N/mm^2 at top and zero at bottom. If tensile stress is 0.7N/mm^2. Find the spacing of 12mm vertical stirrups. Assume all the tension in concrete is to be carried by the stirrups.	CO3	(14)

UNIT – IV

7.	a)	Briefly explain the stress distribution in end block of post-tensioned PSC member?	CO4	(06)
	b)	The end block of a post-tensioned beam is 150X300mm deep. A cable compressing of 3 number of 12-7mm dia & stressed to 1200N/mm^2 is anchored against the end block at 100 mm from the soffit of the beam. The anchorage plate is 75mmx75mm. The cable bears on the plate through a cone of 30mm in dia. Calculate the thickness of the anchorage plate & design the anchorage reinforcement. Given f_{ck}= 30 N/mm^2 at transfer, permissible shear stress in steel plate is 100 N/mm^2. Use Fe-415 steel and sketch reinforcement details.	CO4	(14)
8.	a)	Briefly explain the mechanism by which prestressing force is transferred to concrete in pre-tensioned member.	CO4	(06)
	b)	A freyssinet anchorage 100mm diameter carrying 12 wires of 7 mm diameter is embedded concentrically in the web of I-section of web thickness 225 mm. Using IS code method determine the tensile and busting tensile force in the end block. Design the end block and sketch the reinforcement details. Assume f_p =1600 N/mm^2 and Fe 250.	CO4	(14)

CV701

UNIT – V

9.	Design one of the post tensioned girder which are spaced at 2.5 m c/c and have an effective span of 10m. The L.L is 16 kN/m^2 and D.L is 4 kN/m^2 (which is exclusive of self weight). Pemissible compressive stress in concrete at transfer and working load are 14 MPa and 12 MPa respectively. "No tension" is permitted in concrete. The permissible tensile stress in steel is 1000MPa with a loss ratio of 80%. Minimum covers to the steel should be 100mm. Determine the no. of cables assuming that each cable consists of 14 wires of 8mm diameter.	CO5	(20)
10.	A PSC concrete T-beam is to be designed for imposed load of 15KN/m over an effective span of 15m. Beam is simply supported and is made up of top flange 900mm wide and 200mm thick the rib is 250mm thick and 1000mm deep. The stresses in concrete must not exceed 15 N/mm^2 in compression and no tension at any stage. Check for adequacy of the section provided. Calculate the minimum prestressing force and eccentricity. Loss of prestress is 20%.	CO5	(20)

****