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M S RAMAIAH INSTITUTE OF TECHNOLOGY

(AUTONOMOUS INSTITUTE, AFFILIATED TO VTU)

BANGALORE – 560 054

MAKE UP EXAMINATIONS – FEBRUARY 2012

Course & Branch	:	**B.E.- Civil Engineering**	**Semester**	:	**VII**
Subject	:	**Design of Prestressed Concrete Structures**	**Max. Marks**	:	**100**
Subject Code	:	**CV745**	**Duration**	:	**3Hrs**

Instruction to the Candidates:

- Answer one full question from each unit.
- Use of IS 1343 is permitted.

UNIT - I

1. a) Distinguish between pre-tensioning and post-tensioning. (06)

   b) An unsymentrical I-section of a PSC beam supports a udl of 20kN/m over a span of 8m. It has top flange of 300mm x 160mm, a web of 100mm x 280mm and bottom flange 100mm x 160mm. The effective prestressing force of 100kN is located at 50mm from bottom of beam at mid span section. Find the stresses developed at the mid span section of the beam. (14)

2. a) Discuss the relative merits and demerits of prestessed concrete over reinforced cement concrete. (06)

   b) A prestressed concrete beam 120mm wide by 300mm deep is presetressed by a cable which has eccentricity of 100mm at centre and zero at supports as shown in Fig.2 (b). The span of beam is 6m. If the beam supports two concentrated loads of 10kN each at one-third span points find the magnitude of prestresing force in the cable for load balancing for following cases. (14)

   i) Considering live load but neglecting self weight.

   ii) Considering both self weight and live load. (D_C=24kN/m^3).

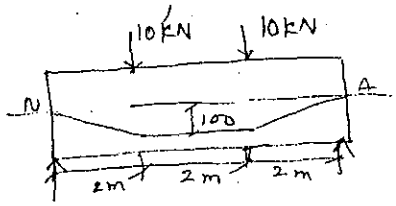

Fig.2(b)

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UNIT-II

3. a) What are the factors affecting deflection in PSC beams and slabs. (06)

   b) A pretensioned beam of rectangular cross-section 150mm wide and 300mm deep is prestressed by 8 wires of 7mm diameter located 100mm from soffit of the beam. If the wired are initially tensioned to a stress of 1100N/mm^2. Calculate the stress of transfer and the effective stress after all losses, given following data. (14)

	Upto time of transfer	Total
Relaxation of stress	35N/mm^2	70N/mm^2
Shrinkage of cone	100×10^{-6}	300×10^{-6}
Creap co-efficient	---	1.6
E_S=210KN/mm^2	E_c=31.5KN/mm^2	

4. a) List the different types of losses in pre-tensioning and post-tensioning separately with expression used to find them. (06)

   b) A prestressed concrete beam spanning over 8m is of rectangular section 150mm wide and 300mm deep. The beam is prestressed by a parabolic cable having an eccentricity of 75mm below the centroidal axis at the centre of span and an eccentricity of 25mm above the centroidal axis at the support section. The initial force in the cable is 350kN the beam supports 3 concentrated loads of 10kN each at intervals of 2m. E_C=38kN/mm^2 density of concrete=24kN/mm^3. (14)

   i) Neglecting losses of prestress, estimate the short term deflection due to prestress + self weight.

   ii) Allowing for 20% loss in prestress estimate the long term deflection under prestress + self weight + live load. Assume creep co-efficient as 1.8.

UNIT-III

5. a) Explain the mechanism of shear failure in PSC beams. (06)

   b) A pretensioned Tee section has a flange width of 300mm and thickness of flange is 200mm. The rib is 150mm wide by 350mm deep. The effective depth at which high tensile steel area of 200mm^2 provided is 500mm. Given f_{ck}=50N/mm^2 and fp=1600N/mm^2. Estimate the flexural strength of the Tee section. (14)

6. a) Discuss the IS method of determining the ultimate moment of resistance of rectangular and flanged sections. (06)

   b) A concrete beam of rectangular cross section 200mm wide and 650mm deep is prestressed by a parabolic cable located at eccentricity of 120mm at mid span and zero at supports. If beam has a span of 12m and carries a udl of 4.5kN/m, find the effective force necessary in the cable for zero shear stress at the support section. For this condition calculate principle stresses. The density of concrete as 24kN/m^3. (14)

UNIT-IV

7. a) Write the procedure for design of end blocks. (06)

   b) The end block of a post-tensioned beam is 300mm wide and 400mm deep. Prestressing wires 12-5mmϕ and 10 number are stressed to 1200N/mm^2. The wires are located at a constant eccentricity of 100mm below the centroidal axis. Design the end block and detail the reinforcement. (14)

   If the anchorage plate is 200x200mm and the diameter of the duct is 100mm, permissible stress in concrete at transfer f_{ci}=20kN/mm^2, permissible shear stress in steel is 94.5N/mm^2, determine the thickness of anchorage plate.

8. a) What is transmission length? List factors influencing transmission length. (06)

   b) The end block of a PSC beam 250mm wide and 500mm deep in section is pre-stressed by two cables carrying force of 450kN each one of the cable is parabolic located at 135mm below centroidal line at centre of span 10m and anchored at a point 125mm above the centroidal axis at the ends. The 2nd cable is straight located 100mm from the bottom of the beam. The distribution plates for the cables are 100mm deep and 250mm wide. Calculate the maximum tensile stress along the axis of the beam using IS code method and design the end block. (14)

UNIT-V

9. Design a beam to support two imposed loads of 3.5kN each located at one-third points over a span of 3m, the beam is of rectangular section, 90mm wide and 180mm deep. If there is no tensile stress in the concrete at transfer and service loads, calculate the minimum prestressing force and corresponding eccentricity D_C=24kN/m^3 loss ratio = 0.8. (20)

10. A prestressed concrete T beam is to be designed to support an imposed load of 4.4kN/m over an effective span of 5m. The T beam is made up of a flange 400mm wide and 40mm thick. The rib is 100mm wide and 200mm deep. The stress in the concrete must not exceed 15N/mm^2 in compression and zero in tension at any stage. Check for the adequacy of the section provided and calculate the minimum prestressing force necessary and corresponding eccentricity. (20)

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