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M S RAMAIAH INSTITUTE OF TECHNOLOGY

(AUTONOMOUS INSTITUTE, AFFILIATED TO VTU)

BANGALORE – 560 054

SEMESTER END EXAMINATIONS – DEC 2013 / JAN 2014

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

Instructions to the Candidates:

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

UNIT – I

1. a) Explain the concept of load balancing and how it is useful. (05)

   b) A Prestressed concrete beam 200 mm wide and 300 mm deep is used over an effective span of 6 m to support an imposed load of 4 KN /m .The density of concrete is 24 KN/m ^{3} .At the quarter span section of the beam ,find the magnitude of the concentric pre stressing force and also find the eccentric pre stressing force if e= 50 mm when the bottom fibre stress is equal to zero in both the cases. (15)

2. a) Explain pre tensioning and post tensioning with sketches. (05)

   b) A rectangular beam of 400 mm x 300 mm has a span of 9 m.The beam supports two point loads each of 30 KN at middle third points .If the eccentricity at the middle third portion is is 100 mm suggest a suitable cable profile .Also calculate the effective pre stressing force required to balance the bending effect of the loads.If the resultant tensile stress at mid span is to be made zero due to pre stress ,self weight and imposed load calculate the initial pre stressing force in the cable for the above profile. (15)

UNIT-II

3. a) What are the factors influencing the deflection of PSC beam? (05)

   b) A rectangular beam 200 mm x 400 mm is simply supported over a span of 10m. The position of the parabolic pre stressing cable is 80 mm from the soffit at mid span and 125 mm from the top at support. If force in the cable is 400 KN and f_{ck}= 38MPa. Calculate (i) The deflection at mid span (15)

due to Prestress and Dead load (ii) The magnitude of the central concentrated load which restores the beam at mid span to the level of supports.

4. a) What are the various factors influencing the loss of pre stress in post tensioned beams? (05)

b) A beam 250 mm wide and 360 mm deep has a span of 12 metres.The beam is pre stressed by steel wires of area 350 mm^2 provided at an uniform eccentricity of 60 mm with an initial prestress of 1250 N/mm^2.Determine the percentage loss of stress in the wires if the beam is pretentioned. Given Es=210 KN/mm^2, Ec=35 KN/mm^2,ultimate creep strain is $45x10^{-6}$/shrinkage of concrete 300X 10^{-6}/relaxation of steel stress =5% of the initial stress,anchorage slip=1.25mm,friction co efficient for wave effect is 0.00015/m. (15)

UNIT-III

5. a) Explain the modes of failure due to shear with sketches (06)

b) A PSC beam 250mm x 1500 mm is subjected to a shearing force of 900 kN. The fibre stress under working loads is $4N/mm^2$. If the effective pre stress is $1000N/mm^2$ and area of cable 1500 mm^2, design the shear Reinforcement. Use M40 concrete. The cables are inclined at an angle $\sin^{-1}$ (1/6). (14)

6. a) How do you determine the ultimate strength of flanged sections (05)

b) A symmetrical double T section has a flange of width 1200 mm and 140 mm thick.T he overall depth of the beam is 1700 mm and thickness of each rib is 150 mm.The member is pre stressed with an effective pre stressing force of 7500 KN through the cables located at a distance of 150 mm from the soffit .The characteristic strength of concrete is 40 N/mm2 .Assuming that grouting is 100 percent effective determine the ultimate moment of resistance of the section.Adopt IS 1343 provisions. (15)

UNIT-IV

7. a) What is transmission length.Also explain the factors influencing transmission length. (05)

b) A pre tensioned beam is pre stressed with 5 mm diameter wires with an initial stress of of 80% of the ultimate tensile strength of steel – fpu 1600 N /mm2 .The cube strength of concrete at transfer is 30 N/mm^2 .Calculate the transmission length.Also compute the bond stress at ¼ and ½ the transmission length from the end. (15)

8. A pre stressed concrete beam 250 mm wide and 650 mm deep is subjected to an effective pre stressing force of 1360 KN along the longitudinal centroidal axis.The cables may be assumed to be symmetrically placed over mild steel anchor plate in an area of 150 mm x 350 mm.Design the end block. Given cube strength of concrete at transfer 30 N/mm^2 ,characteristic strength of concrete 30 N/mm^2 .Assume initial pre stressing force 1.2 times the effective pre stressing force. (20)

UNIT-V

9). Design a symmetrical I-section for a beam of span 16m to carry a live load of 18kN/m. assume compressive stress of concrete as 15MPa at transfer, and 12MPa at working load. The tensile stress is 1 MPa. The initial stress is 1000 MPa. Loss of prestress=20%. (20)

10. A post tensioned PSC beam 300mm wide is to be designed as a rectangular beam to support a UDL of 20KN/m over a simply supported span of 18m. The stresses in concrete must not exceed 16MPa in compression and 1.2 MPa in tension at any stage of loading. Loss of prestress is 17%. Calculate depth of the beam, prestressing force and eccentricity. (20)

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