Total No. of Printed Pages:3

SUBJECT CODE NO:- H-445
FACULTY OF SCIENCE AND TECHNOLOGY
B.E (Civil) (Sem-I)
Elective-I: Prestressed Concrete
[OLD]

[Time: Three Hours] **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B
1. Solve any three questions from section A and B each section
2. Use of IS 1343 and IS 456-200 is allowed
3. Assume suitable data where required and mention it clearly
4. Draw neat sketches in justification where necessary.

Section -A

Q.1 Answer any three of the following

1. The firm got a bulk order of manufacturing of PSC precast electric poles. Which method one shall adopt for manufacturing the same. Explain in detail. 05
2. Is it always necessary that only high strength concrete shall be used for Prestressed Concrete? Justify your statement. 05
3. What is upper and lower kern points in prestressed concrete section. Explain with the help of neat sketch. 04
4. Which are the time dependent losses occurring in pre and post tensioning? Explain in detail loss due to shrinkage and its provisions as per IS 1343. 04

Q.2 An unsymmetrical PSC I section has dimensions as mentioned. Top flange 300mm wide and 60mm thick, bottom flange 100mm wide and 60mm thick, web thickness 80mm and overall depth of beam is 400mm. The beam is used to support a live load of 2kN/m over a span of 8m. The effective prestressing force of 110kN is located at 60mm from soffit of beam. Loss ratio is 0.80 during the entire process. 13

a) Compute the stresses in the concrete at soffit at the center of the span at initial and final stage.
b) If the modulus of rupture of the concrete is 5N/mm^2, determine the load factor against cracking.

Q.3
a) Derive an expression for loss due to friction in post tensioned beam considering length and curvature effect. 03
b) A post tensioned prestressed concrete beam of span length of 12.0m has a rectangular section 300mm wide and 850mm deep. The beam is prestressed by a parabolic cable having eccentricity of 50mm above the center at support and 200mm below at the center of the span. The cross sectional area of HT wires in the cable is 510mm^2. The wires are stressed by using a jack at the left end so that the initial force in the cable at the right end is 250kN. Using following data calculate 10
   a) The jacking force required at the left end
   b) Total loss of stress in the wire
   Coefficient of friction for curvature effect =0.55, friction coefficient for wave effect=

0.003/m, anchorage slip at jacking end =3.0mm, relaxation of steel stress=3% shrinkage of concrete=0.0002, creep coefficient = 2.20, E_s=210kN/mm^2 andE_c= 35kN/mm^2

Q.4 a) What is pressure line? How it is located at various locations along the span i. e end,quarter span and midspan of the beam? 02

b) A beam of symmetrical I section spanning over a length of 9.0m has a flange width 250mm and thickness 75mm. The overall depth of the beam is 500mm. Thickness of the web is 80mm. the beam is prestressed by a parabolic cable having an eccentricity of 150mm at center and zero at support with an effective force of 100kN. The live load on the beam is 2200N/m. Analyze the section at the mid span section for the following conditions **using load balancing concept** 11

i) Prestress + self weight ii) prestress + self weight +live load

Q.5 a) Explain stress distribution of end block as per Guyon's method when single anchor plate is used. 03

b) A post tensioned concrete beam 400mm wide and 800mm wide is prestressed by an effective prestressing force of 1100kN at an eccentricity of 120mm. the anchor plate is 400mm wide by 400mm deep. Calculate the bursting force using IS 1343 code provisions and design the reinforcement to resist this force. Sketch the details of the reinforcement. 10

Section – B

Q.6 Answer any three of the following

1) What is the structural difference in one way and two way slab. Explain with the help of neat sketches where requires. 04
2) How moment of resistance is calculated as per Indian code provisions for rectangular and T-beam for prestressed concrete section. 05
3) Which are the major modes of shear failure? Explain in detail failure due to web shear crack. 05
4) Write down the advantages of prestressed concrete poles. 04

Q.7 a) The composite beam consists of a 120mmX 210mm precast stem and cast – in –situ flange 180mm X 50mm. The stem is a post tensioned unit which is subjected to an initial prestressing force of 230kN. The loss of prestress is 15%. The tendons are provided such that their center of gravity is 80mm above the soffit. The composite beam has to supporta live load of 4.0kN/m. Determine the resultant stresses in the stem and flange if the beam is i) unpropped and ii) propped 13

Q.8 a) A pretensioned PSC Tee section having a flange width of 1200mm and thickness of flange 150mm, thickness of web being 30mm is prestressed by 4700mm^2 of high tensile steel located at an effective depth of 1600mm. If f_{ck}= 40N/mm^2 and fp=1600N/mm^2 then estimate the ultimate moment capacity of pretensioned PSC Tee section 08

b) A PSC beam having an unsymmetrical I section has a fiber stress distribution 13 N/mm^2 compression at the top reducing to zero at the bottom. The top flange width and thickness are 2400 and 400mm respectively, the bottom flange width and thickness are 1200 and 900mm respectively, the depth and thickness of web are 1000 and 600mm respectively. The total vertical service load shear in the concrete at the section is 2350kN. Compute and compare the principal tensile stress at the centroidal axis and junction of web with the lower flange. Consider I_{xx}= 1.54 X 10^{12}. 05

Q.9 A non cylindrical PSC pipe having ID 1200mm and thickness 75mm is required to convey the water at working pressure of 1.20 N/mm^2. The length of the pipe is 6.0 m. The maximum and minimum compressive stresses in the concrete are 15 and 2.0 N/mm^2. The loss ratio is 0.85. 13

i) Design circumferential wire winding using 5mm dia. Wires stressed to 1000N/mm^2

ii) Design longitudinal prestressing using 7mm dia. Wires tensioned to 980N/mm^2. The maximum permissible tensile stress under critical transient loading (wire wrapping at spigot end) should not exceed 0.8 $(f_{ck})^{0.5}$ where f_{ck} is cube strength of concrete at transfer and is 40N/mm^2.

iii) Check safety against longitudinal stresses that develop considering the pipe as hollow circular beam as per IS 784.

Q.10 a) Design the prestressing force and eccentricity for a symmetrical I- section beam having flanges of width 260mm and thickness of flange being 100mm. Thickness of web= 50mm. overall depth of I- section = 520mm, span of the beam =9.0m.The beam supports uniformly distributed live load of 8.0 kN/m. assume compressive strength of concrete at transfer stage as 15.0N/mm^2, loss ratio = 0.80. No tensile stresses are permitted at any of the stage. If 5.0mm dia. HT wires are used which are initially stressed to 1200 N/mm^2, find the no. of wires. 11

b) The horizontal prestress at the centroid of the concrete beam of rectangular section 120mm X 250mm is 7N/mm^2 and the maximum shearing force on the beam is 70.0kN.Calculate the maximum principle tensile stress resulted. 02