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SUBJECT CODE:- 371

FACULTY OF ENGINEERING AND TECHNOLOGY

B.E.(Civil) Examination Nov/Dec 2015

Elective-I: Prestressed Concrete

(Revised)

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

"Please check whether you have got the right question paper."

N.B i) Solve any three question from section A and B

ii) use of IS 1343 and 456 is allowed

iii) Assume suitable data and mention it clearly.

iv) Draw neat figures where necessary.

Section A

Q.1 Solve any three of the following 14

a) Comparison between prestressed and reinforced concrete.

b) Which are various systems of prestressing? Explain any one in detail.

c) How the losses in prestress are broadly classified? Enumerate the losses in pre & post tensioning.

d) Explain the concept of kern point and kern zone in PSC section

Q.2 A prestressed concrete I-beam has its upper flange $750 \times 200mm$ deep, lower flange 400mm wide and 300mm deep and web of depth 500mm and width 150mm. it is supported over a span of 30m and carries a udl of 4 KN/m exclusive of self wt. it is prestressed with 120 wires of 5mm dia with their centroid located at 100mm above the bottom edge and initially tensioned to 1KN/mm^2. Assuming 15% losses in the prestress, determine the extreme fiber stresses at mid span at various stages. 13

Q.3 a) Explain in detail the loss due to creep in concrete 03

b) A straight post tensioned conc. Member long with a cross section of $400 \times 400mm$ is prestresed with 900mm^2 of steel wires. This steel is made up of four tendons with 225mm^2 per tendon. The tendons are tensioned to a stress of 1050 mPa. Determine the loss of stress in each tendon due to elastic shortening of concrete. Find also average percentage loss of prestrers. If it is desired that after the last tendon is tightened a stress of 1-05 KN/mm^2 is to be maintained in each tendon compute the actual stress to which the individual tendons should be tightened. Consider m=6 10

Q.4 A rectangular concrete beam 100mm wide and 300mm deep spanning over a span of 8m is prestressed by a straight cable carrying an effective prestressing force of $250 \times 10^3 N$ located at an eccentricity of 0.4 cm. the beam supports a L.L of $1.5 \times 10^3 N/m$ 13

a) Calculate the resultant stress distribution for central cross section of the beam. Consider density of conc. as 24KN/m^3

b) Find the magnitude of the prestressing force with an eccentricity of 40mm which can balance the stress due to D.L and L.L at the bottom fiber of central section of the beam.

Q.5 a) Explain tension (transverse) at end block 03

b) The end block of PC beam rectangular in section 130×350 deep. The prestressing force of 280KN is transmitting to the concrete by a distribution plate 25 mm wide & 75mm deep, concentrically located at the ends. Calculate the position and magnitude of maximum tensile stresses on the horizontal section through the center of the end block using Guyon's method. Compute the bursting tension on these horizontal planes and required reinforcement for the same. Consider the following data: 10

Dist. ratio	Pos^n of Zero stress	Pos^n of max^m stress	Ratio of max. to avg. stress
0.2	0.14	0.30	0.36
0.3	0.16	0.36	0.33
0.4	0.18	0.39	0.27

SECTION-B

Q.6 a) Explain stepwise procedure for analysis of composite section. 03

b) Which are the different types of PC pipes? Draw a sketch of non-cylindrical PC. Pipe Also state the five stages covered in the design. 03

c) Which are the various methods of computing the flexural straight of PSC section? Explain IS code method in detail. 04

d) Explain the need of providing minimum shear rein in any of the section. Hence explain web shear cracks in PSC member. 04

Q.7 Design a suitable section for a tie member of a truss to support maximum design force of 550KN. The permissible compressive stress in the concrete is 15 MPa and no tension is permitted at working load. The loss ratio is 0.8. 7mm dia. Wires of ultimate strength 1700 N/mm2 with an initial stress of 950 N/mm2 may be used. The direct tensile strength of concrete is 3mPa. 13

Q.8 The deck slab of road bridge of span 12m is to be designed as one way slab with parallel post tensioned cables. Force in each cable at transfer is 600KN. If the slab is required to support L.L=30 KN/m2 with compressive and tensile stresses in concrete at any stage not to exceed 14 and 0 MPa respectively. Find the maximum horizontal spacing of cables and its position at mid span. Consider loss ratio as 0.75. 13

Q.9 a) In design of non-cylindrical PSC pipes how no. of turns of the circumferential reinforcement is worked out? 02

b) In design of non cylindrical PSC pipe write down the expression for thickness of the pipe with explanation of all terms. 02

c) A pretensioned concrete electric pole with uniform circular section stand high 10m above foundation block and subjected to unbalanced horizontal force of 2500 N at top. Design a suitable axially prestress section so that there are no tensile stresses and maximum compressive stress in the concrete shall not exceed 15 MPa. Initial stress in steel is 1000 MPa 09

Q.10 a) A PSC beam of symmetrical I reaction has an overall depth of 2.2m, thickness of web as 220mm. the effective span of beam is 50m. the beam is prestressed by cables which are concentric at support and have ecocentricity of 750 at the center of the span. The force in the cable is 15000KN at transfer stage. Fck=40MPa. Estimate the ultimate shear strength of support section. If the ultimate shear force at the support due to dead load is 2834 KN and the loss ratio is 0.design suitable shear reinforcement using fe 415. Consider the area of section given is $0.9 \times 10^6 mm^2$ 10

b) Explain flexural strength of composite section. 03