[Total No. of Printed Pages:2] **CODE NO:- Z-142**

FACULTY OF ENGINEERING AND TECHNOLOGY

B.E (Civil) Year Examination - June – 2015

Pre-Stressed Concrete (Elective-I)

(Revised)

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

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

N.B
i) Solve three questions from section A and B each.
ii) Use of IS 1343, IS456 and non-programmable calculator is allowed.
iii) Assume suitable data, and state it clearly.

SECTION-A

Q.1 a) Write the assumptions in the design of prestressed concrete members. 03

b) A prestressed concrete pile is 300×300mm in section and is provided with 40 wires of 3mm dia distributed over the section. Initially the wires are tensioned in the prestressing beds with a total pull of 450KN. Determine the final stress in concrete and the percentages loss of stress in the wires. 10

Take Es = 2.08×10^5 MPa, Ec – 3.2×10^4 MPa

Creep shortening = 32×10^{-6} mm/mm per MPa

Total shrinkage strain = 200×10^{-6}.

Relaxation loss of stress in steel = 4.5% of the initial stress.

Q.2 a) Explain the pressure line. 03

b) A prestressed concrete rectangular beam 300mm×600mm is prestressed with a force 1565 KN applied at 180 mm from the bottom, the force finally reducing to 1361KN. The span of beam =12m and carries two equal live loads 45KN each at a distance of 4.0m from each support. Find the extreme fiber stresses at mid span under 10

i) Initial prestress and no live load ii) Final condition

Assume density of concrete = 2.5 KN/m^3.

Q.3 a) Explain the concept of kern points. 03

b) A post tensioned prestressed concrete T-section having a flange width of 1200mm & thickness of 200mm, thickness of web being 300mm is prestressed by 2000mm^2 of high tensile steel located at an effective depth of 1600mm. if fck = 40 MPa & fp = 1600 MPa, estimate the ultimate moment capacity of the unbounded tee section. 10

Assuming $\frac{L}{d}$ 20 & fpe = 1000MPa.

Q.4 A prestressed concrete beam 250 mm wide and 600mm deep is subjected to an axial prestessing force of 1500 KN. Design the end block. 13

Q.5 The end block of a prestressed concrete beam, rectangular in section is 120mm×300mm. the prestressing force of 250KN is transmitted to concrete by a distribution plate 120mm wide and 75mm deep, concentrically located at the ends. Calculate the position and magnitude of the maximum tensile stress on the horizontal section through the centre of end block using magnel's & Guyon's method. Design the reinforcement for the end block for the maximum transverse tension. Take fy = 260 MPa and coefficients for stresses in end blocks (Magnel) 14

Distance from far end $\frac{x}{h}$	K_1	K_2	K_3
0.40	-4.320	2.160	1.728
0.50	-5.000	2.000	1.250
0.60	-4.480	1.600	1.768

Vertical stresses along axis at ends of PC beams (Guyon)

Distribution ratio $\frac{y_{po}}{y_o}$	Position of zero stress $x/2y_0$	Position of max^m stress $x/2y_0$	Ratio of max ten stress to avg stress
0.10	0.09	0.24	0.43
0.20	0.14	0.30	0.30
0.30	0.16	0.36	0.33

SECTION-B

Q.6 The horizontal stress at the centroid of a ptrestressed concrete beam of rectangular section 130mm×250mm is 7.50MPa, and the maximum shear force on the beam section is 70KN. Find the principle tensile stress. Find also the minimum vertical prestress required to eliminate the principle tensile stress 13

Q.7 A prestressed I-section of minimum overall depth 300mm, is required to have an ultimate flexural strength of 86KNm find 13

a) Suitable minimum dimensions of the top flange and

b) The total number of 5mm wires required in the bottom flange. The cube strength of concrete is 60MPa and tensile strength of steel is 1600 MPa.

Q.8 The mid span section of a composite T beam comprises of a pre-tensioned beam, 300mm wide and 900mm deep, and an in-situ cast slab 900mm wide and 150mm deep. The effective prestressing force located 200mm from the soffit of the beam is 2180KN. The moment due to the weight of the precast section is 273KNM at mid span. After this is erected in place, the top slab is cast producing a moment of 136.5 KNM at mid-span. 13

After the slab concrete is hardened the composite section is to carry a maximum line load moment of 750KNM. Compute the resultant final stresses at

a) The top of slab and b) The top and bottom of precast section

Also calculate the ultimate moment capacity of the composite cross-section using IS code provisions.

Q.9 A prestressed concrete pipe of 1-2m diameter, having a core thickness of 75mm is required to with stand a service pressure intensity of 1.2N/mm^2. Estimate the pitch of 5mm diameter high tensile wire winding if the initial stress is limited to 1000 N/mm^2 . permissible stresses in concrete is 12.5 MPa in compression and zero in tension. The loss ratio is 0.8. If the direct tensile stress is 2.5 MPa, estimate the load factor against cracking. 13

Q.10 Design an electric pole 12m high to support wires at top which can exert a reversible horizontal force of 3000N. The tendons are initially stressed to 1000N/mm^2 and the loss of stress due to shrinkage and creep is 15%, comp. stress in concrete shall be limited to 12N/mm^2. Take m=6, and $\phi=30^0$. Soil weighs 18000N/m^3. 14