Government College of Engineering, Aurangabad

(An Autonomous Institute of Government of Maharashtra)

M.E.(Struct.) FT Rev Examination

End Semester Examination- _____2016

AM545: Prestressed Concrete Design

Time: Three hours 17 DEC 2016 2016 Max. Marks: 60

"Verify the course code and check whether you have got the correct question paper."

N.B.:-

1. ***Answer any FIVE questions.***
2. ***Figures to the right indicate full marks.***
3. ***Assume suitable data if necessary and state it clearly.***
4. ***Use of non-programmable calculator is allowed.***
5. ***Use of IS1343 is allowed.***
6. ***Mere reproduction of contents from the code as answer to a theory question will not get full marks.***

Q1. a) Attempt any one of the following, **(3)**

i) Explain the concept of load balancing. Suggest a suitable cable profile for concentrated load, uniformly distributed load with figures and values of the loads counteracted by these cables.

ii) Distinguish between web-shear, flexure-shear, and flexural cracks in concrete beams with sketches.

b) Determine the profile of a load balancing cable for a beam of span10 m carrying an all inclusive load of 40 kN/m. The prestressing force in the tendon is 1250 kN. The section of the beam is 450x 600 mm. Find also the stresses in the beam sections at the mid span and at the end. **(9)**

Q2. A straight post tensioned concrete member 18 m long with cross section of 425 mm x425 mm is prestressed with 920 mm^2 of steel wires one by one. This steel is made of four tendons with 230 mm^2 per tendon. The tendons are tensioned to a stress of 1025 N/mm^2. Determine the loss of prestress in each tendon due to elastic shortening of concrete. Find also the average percentage loss of prestress. If it is desired that after the last tendon is tightened, a stress of 1025 N/mm^2 , be maintained in each tendon, calculate the actual stresses to which the individual tendons should be tightened. Take Es=210 kN/ mm^2, Ec=35 kN/ mm^2 . **(12)**

Q3. A simply supported post-tensioned, prestressed concrete I-section girder having a span of 30 m has to be designed for live load of 8 kN/ m with M50 concrete. The prestress is to be provided by a cable of 12 wire each of 7mm diameter and tensioned to 1200 kN, (housed in a duct of 64 mm). fpu=1750 kN/ mm^2. Loss factor=0.80, permissible compressive stresses $f_{ct}=f_{cw}=15$ N/ mm^2, permissible tensile stresses $f_{tt}=f_{tw}=0$. Check for ultimate flexural strength and deflection at service load. Draw sketches showing cable profile and non tension reinforcement. Load factor for live and dead load are 2.5 and 1.5 respectively. Creep coefficient $\Phi=1.6$. **(12)**

Q4. A two span continuous concrete beam ABC (AB=BC=12m) has a cross section 300mm wide by 800 mm deep. The beam is prestressed by a cable carrying an effective force of 700 kN. The cable has linear profile in the span AB and parabolic in span BC. The eccentricities of the cable are zero at A and C, 100 mm below c.g.c. at a distance 7m from A and 200 mm above c.g.c. at B and 200 mm below c.g.c. at mid span of BC. **(i)** Evaluate the resultant moment developed at B due to the prestressing force only. **(ii)** Sketch the line of thrust in the beam if it supports udl of 5 kN/m which includes self weight of the beam and determine corresponding the stresses at the mid support section. **(12)**

Q5. Design a post tensioned prestressed concrete two way slab simply supported at edges is 8m x 10m to support a live load of 3 kN/m^2. Cables of 6 wires of 5 mm diameter high tensile wires initially stressed to 1000 kN/ mm^2 are available for the use. Determine the spacing of the cables in two principle directions. The stress in concrete not to exceed 15 kN/ mm^2 in

compression and zero in tension. Check for the limit state of collapse and against deflection at working load. Assume f_{pu}=1750 N/ mm^2, f_{ck}=40 N/ mm^2, Ec=40 kN/ mm^2 and Loss factor =0.8. Creep coefficient Φ=1.6. **(12)**

Q6. A prestressed concrete beam of effective span of 20 m is of rectangular section 450 mm wide by 1300 mm deep. The tendons consist of 3300 mm^{2}of strands of characteristic strength of 1700 N/mm^2 with an effective prestress of 910 N/mm^2. The strands are located 920 mm from the top face of the beam. If f_{ck}=60 N/mm^2. Estimate the flexural strength of the section as per IS:1343 **(12)**