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Reg. No: | | | | | | | | | | |

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

M TECH II Year I Semester Regular Examinations Dec 2019

DESIGN OF PRESTRESSED CONCRETE STRUCTURES

(STRUCTURAL ENGINEERING)

Time: 3 hours Max. Marks: 60

(Answer all Five Units **5 x 12 = 60** Marks)

UNIT-I

1	a	Explain Pretensioning and Post tensioning of concrete members. What are the advantages of prestressed concrete members over reinforced concrete members?	6M
	b	Briefly outline the advantages of using high strength concrete & high strength steel in prestressed concrete structures.	6M

OR

2	a	Explain the Magnel Blaton system of prestressing with the help of a neat sketch.	6M
	b	Discuss the various losses that take place in post tensioned members	6M

UNIT-II

3		A post-tensioned cable of beam 10m long is initially tensioned to a stress of 1000N/mm^2 at one end. If the tendons are curved so that the slope is 1 in 24 at each end, with an area of 600mm^2, Calculate the loss of prestress due to friction given the following data. Coefficient of friction between duct and cable = 0.55, friction coefficient for wave effect = 0.015 per m. During anchoring, if there is a slip of 3mm at the jacking end, calculate the final force in the cable and the percentage due to friction and slip E_s = 210kN/mm^2	12M

OR

4		A concrete beam of 10 m span 100 mm wide and 300 mm deep is prestressed by 3 cables. The area of each cable is 200 mm^2 and the initial stress in the cable is 1200 N/mm^2. Cable 1 is parabolic with an eccentricity of 50 mm above the centroid at supports and 50 mm below at the centre of span. Cable 2 is also parabolic with zero eccentricity at supports and 50 mm below the centroid at the centre of span. Cable 3 is straight with an uniform eccentricity of 50 mm below the centroid. If the cables are tensioned from one end only, estimate the percentage loss of stress in each cable due to the effects of friction. Assume K=0.0015/M.	12M

UNIT-III

5		A prestressed T-section has flange 1200mm wide and 150 mm thick. The width and depth of rib are 300 and 1500 mm respectively. The high tensile steel has an area of 4700 mm^2 and is located at an effective depth of 1600mm. if the characteristic cube strength of the concrete and tensile strength of steel are 40 and 1600N/mm^2, calculate the flexural strength of the T-section	12M

OR

6 A prestressed concrete bridge deck comprises any unsymmetrical-I section beams spanning over 20m has dimensions of depth and width of top flange is 200mm, 1200mm, depth and width of web is 900mm, 200mm and depth and width of bottom flange is 400mm, 500mm.The cross-section of a typical beam is shown in figure .The beam is prestressed by seven freyssinet cables, each carrying an effective force of 600kN located 200mm from the soffit at the centre of span section. If the total maximum bending moment at the centre of span of the girder is 4000kN-M. Estimate the resultant stress developed at the section using the internal resisting couple method. 12M

UNIT-IV

7 A cantilever portion of a prestressed concrete bridge with a rectangular cross-section, 600mm wide and 1650mm deep is 8m long and carries a reaction of 350kN from the suspended span at the free end, together with a uniform distributed load of 60kN/m inclusive of its own-weight. The beam is prestressed by seven cables each carrying a force of 1000KN, of which three are located at 150mm, 3 at 400mm, and one at 750mm, from the top edge. Calculate the magnitude of the principle stresses at a point 550mm from the top of cantilever at the support section. 12M

OR

8 Explain Guyon's method of computing bursting tension in the case of end blocks subjected to Forces not evenly distributed with multiple anchorages 12M

UNIT-V

9 A cylindrical prestressed concrete water tank of internal diameter 30 m is required to store water over a depth of 7.5 m. The permissible compressive stress in concrete at transfer is 13 N/mm^2 and the minimum compressive stress under working pressure is 1 N/mm^2. The loss ratio is 0.75 wires of 5 mm diameter with an initial stress of 1000 N/mm^2 are available for circumferential winding and Freyssinet cables made of 12 wires of 8 mm diameter stressed to 1200 N/mm^2 are to be used for vertical prestressing. Design the tank walls assuming the base as fixed. The cube compressive strength of concrete is 40 N/mm^2. 12M

OR

10 A non-cylinder prestressed concrete pipe of 1.6m diameter with a core thickness of 100mm is required to withstand a working pressure of 1N/mm^2. Determine the pitch of a 5mm diameter wire winding if the high-tensile initial stress in the wire is limited to 1000N/mm^2. The permissible maximum and minimum stresses in concrete are 12N/mm^2 (compression) and zero (tension). The loss ratio is 0.8. If the direct tensile strength of concrete is 2 kN/mm^2, Estimate the load factor against cracking. 12M

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