Code No: R32015 **R10** **Set No: 1**

III B.Tech. II Semester Supplementary Examinations, January -2014

DESIGN & DRAWING OF CONCRETE STRUCTURES-II

(Civil Engineering)

Time: 3 Hours **Max Marks: 75**

Note: Answer any ONE question from PART-A and THREE question from PART-B
IS Code books are permitted in the examination hall..

PART-A

1. A reinforced concrete grid floor is to be designed to cover a floor area of size 12m by 16m.The spannings of the ribs in mutually perpendicular directions being 2m c/c. Live load =1.5 kN/m^2 .Adopt M-20 grade concrete and tor steel. Analyze the grid floor for moments and shear. Design suitable reinforcements at critical sections.

2. Design a combined footing for two columns C_1 (400mm x 400mm with 4-25 ϕ bars) and C_2 (500mmX500mm with 4-28 ϕ bars) supporting axial loads P_1 =900kN and P_2=1600kN respectively .The column C_1 is an exterior column whose exterior face is flush with the property line. The centre-to- centre distance between C_1 and C_2 is 4.5m.The allowable soil pressure at the base of the footing, 1.5m below ground level, is 240 kN/m^2 .Assume steel of grade Fe415 in columns as well as footing, and concrete of M30 grade in columns and M20 grade in footing.

(Part B)

3. (a) What are the principles of pre stressing in pre tensioning and post tensioning?
   (b) What are the various states of loading stages to be considered in the design of pre stressed concrete structures?

4. (a) Explain with neat sketch Mangle Blanton system of Pre stressing.
   (b) Explain bonded and unbounded tendons
   (c) Creep and shrinkage losses in pre stress

5. A straight post tensioned concrete member is 15 m long with a cross-section of 400mm x 400 mm is pre stressed with 900 mm^2 of steel wires. This steel is made of four tendons with 225 mm^2 per tendon. The tendons are tensioned to a stress of 1050 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 1050 N/mm^2 be maintained in each tendon, compute the actual stresses to which the individual tendons should be tightened. Take modular ratio =6.

6. A pretensioned beam of rectangular section, 80mmwide x 120mm deep is to be designed to support concentrated loads of 4 kN each at one-third span points over an effective span of 3m. The permissible stresses in concrete are limited to zero and 1.4 N/mm^2 in tension at transfer and working load respectively. If 3mm diameter wires initially stressed to 1400N/mm^2 is used. Find the number of wires required and the eccentricity of the prestressing force, assuming 20% loss in prestress. Weight of concrete is 25 kN/m^3.

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7. A post tensioned concrete beam of rectangular section 250mm wide and 500mm deep has a span of 12.5m and carries a superimposed load of 5kN/m. The tendon is provided with a parabolic profile with a central dip of =180mm and with no eccentricity at the ends. The effective prestressing force in the tendon is 750kN. Determine:
   (a) The principal stresses at the supports
   (b) The principal stresses at the supports without prestress. Take weight of concrete as $24kN/m^3$.

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DESIGN & DRAWING OF CONCRETE STRUCTURES-II

(Civil Engineering)

Time: 3 Hours **Max Marks: 75**

Note: Answer any ONE question from PART-A and THREE question from PART-B
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PART-A

1. A two way slab 5m by 5m size with ribs at 1m intervals is to be designed to support a live load of 4 kN/m^2. Adopting M-15 grade concrete and Fe-415 grade for steel, design a suitable grid floor and sketch details of reinforcement in ribs.

2. A portico slab of clear projections 3 m and length 5 m is supported by two cantilevered inverted T-beams at 3 m centers with equal overhangs of slab. Thickness of slab is 100 mm. Imposed load on the slab is 4kN/m^2. Breadth of rib of T-beams is 250 mm. Design the support section of the beam for bending using M25 grade concrete and mild steel.

(Part B)

3. (a) What is the necessity of using high strength steel and high strength concrete in prestressed concrete ?
   (b) What are the advantages of prestressed concrete members over R.C.C members?

4. (a) Explain with the help of neat sketch the Freyssinet system of post tensioning.
   (b) Distinguish between pretensioned and post tensioned members.
   (c) Discuss length and curvature effect in case of curved cables.

5. A prestressed concrete beam of rectangular section 400mm wide and 600mm deep is provided with an inclined tendon with an eccentricity of 50mm above the centroid at supports and 100mm below the centroidal axis at the centre of span. The span of the beam is 6m. The beam carries a point load of 160kN at the centre. The dead load of the beam is 6kN/m. The prestressing force is 1000kN. Determine the stress distribution for the end section and mid section of the beam by following methods.
   (a) Stress concept method.
   (b) Strength concept method. (c) Load balancing method

6. A pretensioned beam 250mm wide and 300mm deep is prestressed by 12 wires each of 7mm diameter initially stressed to 1200N/mm^2 with their centroid located at 100 mm from the soffit. Estimate the final percentage loss of stress due to elastic deformation, creep, shrinkage and relaxation using IS:1343-80 code and the following data:
   Relaxation of steel stress=90N/mm^2
   E_S=210KN/mm^2
   Creep coefficient (φ) = 1.6
   Residual shrinkage strain = 3 x 10^{-4}

7. A prestressed concrete beam 250mm wide and 600mm deep is subjected to an axial prestressing force of 1500kN. Design the end block using Guyon's method.

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DESIGN & DRAWING OF CONCRETE STRUCTURES-II

(Civil Engineering)

Time: 3 Hours **Max Marks: 75**

Note: Answer any ONE question from PART-A and THREE question from PART-B
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PART-A

1. A reinforced concrete grid floor of size 9m by 12m is required for an assembly hall. Assuming rib spacing of 1.5m in the short span direction and 2m in the long span direction, design the grid floor. Adopt M-20 grade concrete and Fe-415 grade tor steel. Live load may be assumed as 4 kN/m^2.

2. Design a footing for a 250mm thick reinforced concrete wall which supports a load (inclusive of self weight) of 250 kN/m under service loads. Assume a safe soil bearing capacity of 180 kN/m^2 at a depth of 1m below ground. Assume M -20 grade concrete and Fe-415 grade steel for both wall and footing.

(Part B)

3. (a) Define a prestressed concrete member. Explain the advantages and applications of prestressed concrete.
   (b) Explain in detail the Gifford Udal system of prestressing with the help of neat sketch.

4. (a) Differentiate a fully prestressed member and a partially prestressed member
   (b) A prestressed concrete beam of uniform rectangular cross section and span 15m supports a total distributed load of 272kN excluding the weight of the beam. Determine the suitable dimensions of the beam and calculate the area of the tendons and their position. The permissible stresses are 14 N/mm^2 for concrete and 1050 N/mm^2 for the tendons.

5. A prestressed concrete beam section is 250mm x 300mm deep. The initial prestressing force is 470kN at an eccentricity of 65mm. the beam has a span of 6m and has to carry a superimposed load of 7.75 kN/m. Analyse the beam section for the stresses produced at midspan before and after the application of live load. Allow a loss of prestress of 18%. Take the weight of concrete as 24kN/m^3.

6. A straight post tensioned concrete member is 18m long with a cross section of 425mm x 425mm is prestressed with 920 mm^2 of steel wires. This steel is made up of four tendons with 230mm^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 conce rte. Find also the average percentage loss of prestress. If it is desired that after the last tendon is tightened, a stress of 1025N/mm^2 , be maintained in each tendon, calculate the actual stresses to which the individual tendons should be tightened. Take m=6.

7. A prestressed concrete beam is 400mm wide and 800mm deep. The cable is placed axially. The anchor plate is 300mm wide and 200mm deep. The prestressing force is 1000kN. Determine the horizontal section through the centre of anchor plate. Take the shear stress factor as 1.25 and vertical stress factor as -5 respectively. Find also the principal stresses. Use Magnel's method

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DESIGN & DRAWING OF CONCRETE STRUCTURES-II

(Civil Engineering)

Time: 3 Hours **Max Marks: 75**

Note: Answer any ONE question from PART-A and THREE question from PART-B
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PART-A

1. An orthotropic reinforced concrete grid 16m by 20m is required for the roof of an auditorium. The ribs are spaced at 2m intervals. Live load on roof =1.5 kN/m^2. Adopt M-20 grade concrete and Fe-415 grade tor steel. Design suitable reinforcements in the grid beams and sketch the details of reinforcements.

2. Design a combined footing for two columns C_1 (400mmX400mm with 4-25 ф bars) and C_2 (500mmX500mm with 4-28 ф bars) supporting axial loads P_1 =900kN and P_2=1600kN respectively .The column C_1 is an exterior column whose exterior face is flush with the property line. The centre-to- centre distance between C_1 and C_2 is 4.5m.The allowable soil pressure at the base of the footing ,1.5m below ground level, is 240 kN/m^2 .Assume steel of grade Fe415 in columns as well as footing, and concrete of M30 grade in columns and M20 grade in footing

(Part B)

3. (a)Distinguish between pretensioning and post tensioning systems. Discuss the advantages of prestressed concrete members over R.C.C members.
(b) Explain with the help of neat sketch Lee-Mechall system of post tensioning.

4. A concrete beam of symmetrical I section spanning 8m has a flange width and thickness of 200 and 60mm respectively. The overall depth of the beam is 400mm.The thickness of the web is 80mm. The beam is prestressed by a parabolic cable with an eccentricity of 15mm at the centre and zero at the supports with an effective force of 100kN. The live load on the beam is 2kN/m. Draw the stress distribution diagram at the central section for
   (a) Prestress+Self weight
   (b) Prestress + Self weight + Live load. Take density of concrete as 24kN/m^3.

5. A prestressed concrete pile is 300mm x 300mm in section and is provided with 40 wires of 3mm diameter distributed uniformly 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 percentage loss of stress in the wires. Take $E_S = 2.08 \times 10^5$ N/mm^2, $E_C = 3.20 \times 10^4$ N/mm^2, creep shortening = 32 x 10^{-6} mm/mm per N/mm^2, total shrinkage strain= 200 x 10^{-6}, Relaxation of stress in steel =4.5% of the initial stress.

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6. A prestressed concrete beam of rectangular section 400mm x 600mm is provided with a parabolic tendon with zero eccentricity at supports and an eccentricity of 100mm at the centre of span. The span of the beam is 6m. The total external load on the beam is 35kN/m on the whole span. The tendon carries a prestressing force of 1000kN. Calculate the extreme stresses for the mid span section using the following methods
   (a) Stress concept method
   (b) Strength concept method
   (c) Load balancing method

7. A prestressed I section has the following properties.
   Area= 55×10^3 mm^2,
   Second moment of area =189×10^7 mm^4,
   Statical moment about the centroid = 468×10^4 mm^3,
   Thickness of web = 50 mm.
   It is prestressed horizontally by 24 wires of 5mm diameter and vertically by similar wires at 150 mm centers. All the wires carry a tensile stress of 900 N/mm^2. Calculate the principal stresses at the centroid when a shearing force of 80kN acts upon this section.

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