Code No: 07A80101 **R07** SET 1

B.Tech IV Year II Semester Examinations, April/May-2012
ADVANCED STRUCTURAL DESIGN
(CIVIL ENGINEERING)

Time: 3 hours **Max. Marks: 80**

Answer any five questions
All questions carry equal marks

Note: Relevant IS codes are permitted

1. A cantilever retaining wall is to be constructed for a road for the following requirements:
   Height of wall from the bottom of base to top of stem = 6.0m
   Superimposed load due to road traffic = 18kN/m^2
   Unit weight of fill = 18kN/m^2
   Angle of internal friction for fill material = 30^0
   Allowable bearing pressure on ground = 160kN/m^2
   Coefficient of friction between concrete and ground = 0.4
   Use M15 concrete Take σ_{st} = 140N/mm^2.
   a) Check the stability against sliding and over-turning
   b) Design the stem portion. [8+8]

2. Design a circular tank with flexible base for capacity of 400000 liters. The depth of water is to be 4m, including a free board of 200mm. Use M20 concrete. Give details of reinforcement. [16]

3. Design an overhead riveted steel rectangular flat bottom tank of capacity 70000 liters. The available width of plates is 1.22m and lengths up to 6.1m.The staging consist of 4 columns, spaced 4.88m x 3.66m and the bottom of the tank is 9.14m above the ground level. [16]

4. A coal bunker is to be designed to store 300kN of coal having a unit weight of 8kN/m^3. The bunker should be square with 3 meters sides. The stored coal is to be surcharged at an angle of repose which is 30 degrees for coal. Adopt M25 grade concrete and Fe415 steel and design the side walls and hopper bottom and sketch the details of reinforcement. [16]

5. Design a R.C. Slab culvert for the following data:
   Culvert to be on state highway
   Width of bridge = 12.0m
   No footpath provided
   Conditions of exposure: 'Moderate'
   Materials : Concrete grade M25

Steel-Deformed bars to IS: 1786(grade Fe 415)
Clear span = 5.0m
Height of Vent = 3.0m
Depth of foundation = 1.35m
Wearing course: 56 mm thick asphaltic concrete.
Note: (Consider IRC class 'AA' & Class 'A' loading for computing Live loads) [16]

6. Design a gantry girder for a mill building to carry an electric overhead travelling crane, having the following data:
Crane capacity = 250kN
Weight of crane excluding crab = 200kN
Weight of crab = 60kN
Span of Crane between rails = 20m
Minimum hook approach = 1.1m
Wheel base = 3.4m
Span of gantry girder = 7m
Mass of rail section = 30kg/m
Height of rail section = 75mm
Take f_y =250N/mm^2 and E = 2 x 10^5 N/mm^2. [16]

7. A Pratt truss girder through bridge is provided for single broad gauge track. The effective span of bridge is 50m. The cross girders are spaced 5m apart. The stringers are spaced 2m between center lines. 0.60kN per meter stock rails and 0.40kN per meter check rails are provided. Sleepers are spaced at 0.45m from centre to centre and are of size 2.8m x 250mm x 250 mm. Weight of timber may be assumed as 7.50kN per cubic meter. The main girders are provided at a spacing of 7m between their centre lines. Design the central top chord member and bottom chord member and the vertical and diagonal of central panel. The bridge is to carry standard main line loading (Figure 1). [16]

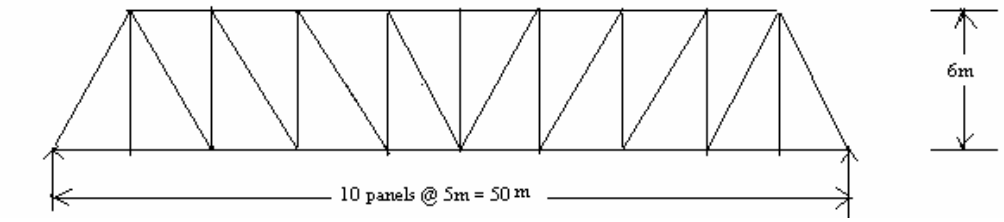

Fig:1

8.a) What does the seismic code IS-13920:1993 deal with? Why is it necessary to incorporate ductile detailing for Earth quake resistant design?
b) What is special confining reinforcement? Where should we provide it? [16]

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ADVANCED STRUCTURAL DESIGN
(CIVIL ENGINEERING)

Time: 3 hours **Max. Marks: 80**

Answer any five questions
All questions carry equal marks

Note: Relevant IS codes are permitted

1. Design a cantilever retaining wall to retain earth embankment 3m high above ground level. The unit weight of earth is 18kN/cum and its angle of repose is 30 degrees. The embankment is horizontal of at its top. The safe bearing capacity of soil may be taken as 100kN/sqm and the coefficient of friction between soil and concrete as 0.5. Use M20 grade concrete and Fe415 steel. [16]

2. Design a square water tank for 300 KL capacity. Adopt M25 and Fe415 grades of concrete and steel respectively. [16]

3. Design an elevated circular steel tank to hold 250000 liters of water. The staging and the circular supporting beam need not be designed. [16]

4. A cylinder silo having the ratio of height (cylindrical portion) to the diameter of 4 is required to store 2000kN of wheat weighing 8kN/cum. The coefficient of friction between grain and concrete is 0.444 and that between grains is 0.466. Determine the lateral pressures developed at 4m intervals using Airy's theories. Design the reinforcements in the wall and the conical bottom for the worst case. Adopt M20 grade concrete Fe415 HYSD bars. [16]

5. Design a slab culvert for the given data
Clear Span = 6.0m. Carriage way width = 2 lane
Loading = IRC Class 'AA' loading. Materials: M20 concrete and Fe 415 steel. [16]

6. Design a gantry girder to carry an overhead traveling crane, having the following data:

Span of gantry girder	= 6m
Crane capacity	= 200kN
Distance between centers of gantry girder	= 16m
Weight of crane girder	= 120kN
Weight of crab	= 50kN
Minimum approach of crane hook	= 1.02m
Distance between centers of wheels	= 3.8m
Height of rail section	= 80mm
Mass of rail section	= 30kg/m

Take Permissible value of steel as 250N/sqmm. [16]

7. A through type highway steel bridge 48m span, is supported on two N-girders each consisting of 10 bays of 4.8m each, the height of the N-girder being 4.8m. The dead load of the bridge including self weight of the two N-girders is 90kN/m and the rolling load on the bridge, to be carried by the two girders is equivalent to100kN/m. Design the top and bottom chords at the fifth panel of the bridge. [16]

8.a) Explain the various codal provisions for ductile detailing of longitudinal reinforcement in a beam.

b) What is the role of transverse reinforcement in a beam? Explain various recommendations about providing stirrups in a beam as per IS 13920. [8+8]

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Code No: 07A80101	R07	SET 3

B.Tech IV Year II Semester Examinations, April/May-2012
ADVANCED STRUCTURAL DESIGN
(CIVIL ENGINEERING)

Time: 3 hours **Max. Marks: 80**

Answer any five questions
All questions carry equal marks

Note: Relevant IS codes are permitted

1. Design a counter fort retaining wall to retain 7m high embankment above ground level. The foundation is to be taken 1m deep where the safe bearing capacity of soil may be taken as 180kN/sqm. The top of earth retained is horizontal, and soil weighs 18kN/cum with an angle of internal friction Φ = 30 degrees. Coefficient of friction between concrete and soil may be taken as 0.5. [16]

2. Design longer wall of a water tank for the following data:
Size of tank = 2.5m x 6m x 3m (height)
Adopt M20 and Fe 415 grades of concrete and steel respectively. [16]

3. Design an over head riveted steel rectangular flat bottom tank of capacity 120000 liters. The staging consists of six columns. The bottom of the tank is 10m above the ground. Design the supporting beams also. [16]

4. A concrete chimney of height 80m with the external diameter of the shaft being 4m at top and 5m at bottom is required in a place where the wind intensity is 1.5kN/sqm. Thickness of fire brick lining is 10cm. Temperature difference between the inside and outside of shaft = 75^0C. Permissible bearing pressure on soil at site = 150kN/sqm. Adopt M25 grade concrete mix and Fe415 grade steel. Design the base section of the chimney. [16]

5. Compute the design live load moments for R.C Slab with specified data given below:

Loading	:	IRC class A
Carriage way width	:	Two lane
Foot paths	:	1.0m on either side
Clear span	:	5.5m
Wearing coat	:	75mm
Width of bearing	:	300mm
Materials	:	M20 grade concrete and Fe415 steel. [16]

6. The effective span of a through type plate girder two lane highway bridge is 30m. The reinforced concrete slab is 250mm thick inclusive of the wearing coat. The footpaths are provided on both sides of the carriage way. The cross girder are provided at 3m centers. The stringers are spaced at 2.45m centre to centre. The spacing between main girders is 9.80m. Design the maximum section of plate girder, if the bridge is to carry IRC class 'A' standard loading. [16]

7. A Pratt truss girder through bridge is provided for a single meter gauge track. The effective span of the bridge is 50m. The cross girders are 4m apart. The stringers are spaced at 1.20m between centre lines. 0.60kN per meter stock rails and 0.40kN per meter guard rails are provided. The sleepers are spaced at 0.50m from center to center and are of size 2m x 250mm x 250mm. weight of timber may be assumed as 7.50kN per cubic meter. The main girders are provided at spacing of 5m between their center lines. Design the central top chord member, the central bottom chord members, vertical and diagonal members. [16]

8. A two storied reinforced concrete framed building has plan dimensions as shown in figure2. The size of the exterior column (9 each on line A and C) are 30cm x 50cm and the interior columns (9 on line B) are 30cm x 60cm. The height between floors is 3.50m. The dead load per unit area of the floor which consists of floor slab, beam, half the weight of columns above and below the floor, partition walls, etc, is assumed to be of intensity 5000N/sqm. The intensity of normal live load is assumed as 3000N/sqm. The soil below the foundation is assumed to be hard. The building is located in seismic zone IV in India. Estimate the base shear and its distribution at the floor level by seismic coefficients method. [16]

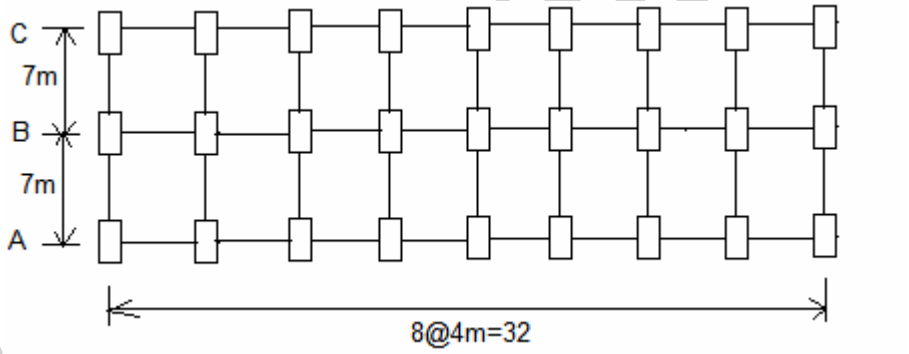

Fig:2

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Code No: 07A80101 **R07** SET 4

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ADVANCED STRUCTURAL DESIGN
(CIVIL ENGINEERING)

Time: 3 hours **Max. Marks: 80**

Answer any five questions
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Note: Relevant IS codes are permitted

1. Design a counter fort retaining wall for the following data:
   i) Height of wall above ground ,8m
   ii) Depth of foundation , 1.5m
   iii) Safe bearing capacity, 200kN/sqm
   iv) Unit weight of earth fill, 18kN/sqm
   v) Surcharge angle 18 degrees
   vi) Angle of internal friction for backfill, 30 degrees
   vii) Face to face spacing of front counter forts , 2m
   viii) Face to face spacing of front counter forts, provided upon ground level, 2m
   ix) Coefficient of friction between soil and concrete, 0.55.
   Use M20 grade concrete and Fe415 steel reinforcement. [16]

2. Design a circular tank with flexible base for capacity of 400000 liters. The depth of water in tank is to be 4m, including free board of 200mm. Detail the reinforcements at typical sections. Use M20 concrete. [16]

3. Design an elevated steel tank, circular in shape for 240000 liters capacity with circular girder supported on eight numbers of columns. The shape of bottom may be assumed suitably. The roof and staging for the tank need not be designed. [16]

4. A cement silo has an internal diameter of 10m with the height of cylindrical portion being 30m. The density of cement is 15.2kN/cum. Coefficient of friction between concrete and material is 0.70. The angle of repose of the material is 17.5 degrees. Adopting M20 grade concrete and Fe415 HYSD bars, design the thickness and the reinforcement required at the bottom of the cylindrical portion of the silo using Airy's theory. [16]

5. Design a T-beam bridge for the following data:
   Clear width of road way = 7.5m
   Effective span of bridge = 18m
   Live load: IRC class AA loading
   Thickness of wearing coat = 75mm
   Materials: M20 grade concrete and Fe 415 steel. [16]

6. Determine the increase or decrease of stresses in the flanges of leeward girder of a deck type plate girder bridge for the broad gauge single track due to overturning effect and the horizontal truss effect due to wind for loaded and unloaded span. The particulars of the bridge are as follows:
Effective span of the bridge = 30m
Spacing between main girder = 2m
Depth of plate girder = 2.16m
Intensity of wind for unloaded span = 2.40kN/sqm
Intensity of wind for loaded span = 1.50kN/sqm
Height of rolling stock above 600mm from rail level=3500mm
Height of rails above plate girder = 400mm
Net area of tension flange = 26000 sqmm
Gross area of compression flange = 30000 sqmm
Gross moment of inertia of the plate girder section about xx – axis = 12×10^{10} mm^4 [16]

7. The effective span of a through type Pratt truss girder Railway Bridge for a single broad gauge track is 50m. Pratt truss girder consists of 10 panels @ 5m. The height of girder between c.g to c.g of chords is 6m. The spacing between main truss girders is 7m. The rail level is 800mm above the c.g of bottom chord. The chord members are 600mm deep x 644mm wide. The inner web members are 600mm deep x 260mm wide. The end posts are 600mm deep x 644mm wide. Determine the increase or decrease of forces in the central chord member of the leeward truss girder in the following cases:
   a) Overturning effect due to wind, when the bridge is unloaded.
   b) Overturning effect due to wind, when the bridge is loaded. [16]

8. A two-storied building has plan dimensions as shown in figure3. The size of columns on the two exterior rows is 230 x 300mm. The size of interior column in the middle row is 230 x 450 mm. The height of each floor 3m. The live load on each floor is 4kN/sqm in addition to dead load of beams, slabs, etc. The soil below the foundation is assumed to be hard. The building is located in zone IV. Estimate the base shear and its distribution at various floors by seismic coefficient method. [16]

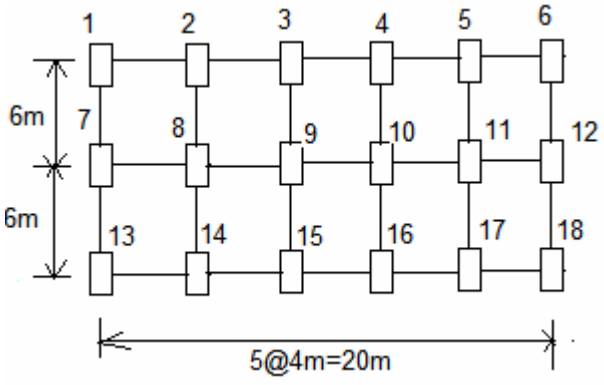

Fig:3

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