Set No.1

Code No: RR420108

IV B.Tech II Semester Supplementary Examinations, June 2007
ADVANCED STRUCTURAL ENGINEERING
(Civil Engineering)

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

Answer any FOUR questions
All Questions carry equal marks
Assume suitable data whatever necessary
Use of I.S. codes and Structural Tables is permitted.

1.a) What is the difference between a ``Silo" and a ``bunker". Derive Janssen's formula to calculate the pressures in silos.

b) Fix up the dimensions of a silo to store 2000kN coal if its unit weight is 8 kN/m^3. Design its side wall. Use M 20 grade concrete & Fe-415 grade steel. Take μ=0.466. and μ' = 0.444. [8+12]

2. Design the hopper bottom of a square bunker 3m x 3m x 4m height to store coal having unit weight 8 k N/m^3. The slope is 45^o for the hopper bottom with a square opening. Use M-20 grade of concrete and Fe-415 grade steel. Sketch the reinforcement details. Take $\varphi = 30^o$. [20]

3. With the help of an example illustrate the combined effect of self-weight, wind load and temperature stresses in the analysis of R.C. chimneys. [20]

4. Using IS: 456 code method design suitable reinforcement in the R.C. grid floor covering an area of 9 x 15m. The spacing of ribs in mutually perpendicular directions is 1.5m c/c. Use M-20 grade concrete and HYSD bars. Sketch the reinforcement details. [20]

5. A single span composite steel girder and R.C is to be designed for a state highway across a stream. Take the span 16 m and width of load 6m. There are 5 R.S.Js placed longitudinally and symmetrically. Adopt M-150 grade concrete and HYSD bars. Design the deck slab for an equivalent live load of 1.2 kN/m^2 and impact factor 0.5. Sketch details. [20]

Contd…2

6. Design the shear connectors for a R.C. deck and I-girder 500 mm wide, 1000 mm deep web, 30mm thickness of flanges, width of web 20 mm and the deck slab thickness 300mm:

   $A = 77{,}100\ mm^2$
   $I = 2.7 \times 10^{10}\ mm^4$
   $V = 545\ kN$
   $a = 46100 mm^2$
   $\bar{y} = 210mm.$
   Find the shear stress and total S.F. at junction. Find the capacity of one 25 mm diameter stud and the no. of studs required. Sketch the details. [20]

7.a) Without doing the actual analysis, name some of the methods for analyzing
   i) Folded plates and ii) Shell
 b) In what situations folded plate structures are preferred? Discuss
 c) Illustrate the components of
   i) Shell structure ii) Folded plate structure. [6+4+6]

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Set No.2

Code No: RR420108

IV B.Tech II Semester Supplementary Examinations, June 2007
ADVANCED STRUCTURAL ENGINEERING
(Civil Engineering)

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

Answer any FOUR questions
All Questions carry equal marks
Assume suitable data whatever necessary
Use of I.S. codes and Structural Tables is permitted.
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1. Design the side walls of an R.C. silo of height 16m and 4m diameter to store wheat having unit weight 8 kN/m^2. Use M20 grade and Fe-415 grade steel. Sketch the details of reinforcement details. [20]

2.a) How is a ``Silo" different from a``bunker"?
b) What is the difference between the Janssen's theory and Airy's theory of evaluation of pressures
c) Evaluate the horizontal pressures at 1m intervals for a square bunker (3 x 3m) of height 4m having coke, of density 4.5 kN/m^3, stored in it Take $\phi = 30^o$. [4+6+10]

3. Design an R.C. chimney of 45m height having external diameter of 4m throughout. 10cm thick brick lining is provided, supported at 5m interval. Air gap of 150mm is provided consider 3 portions of 15m each, with uniform width pressure of 1.5 kN/m^2 . Use M-25 grade concrete and HYSD bars. [20]

4. An Orthotropic grid floor of R.C is required to cover a floor of 16m x 20m. The spacing of grids is 2m c/c and the live load = 1.5 kN/m^2. Use M-20 grade concrete and HYSD bar. Sketch the reinforcement details. [20]

5. Design a composite bridge deck with R..C slab and steel plate girders to cover a span of 18m. The clear width of roadway=7.5m and there is a foot path of 1m on either side. The spacing of main girder =2m c/c Take the live load as IRC class A tracked vehicle. Use M40 grade concrete and Fe-415 grade steel. Sketch details. [20]

6. What are shear connectors and where they are used? Explain the analysis and design of shear connectors in a composite bridge deck construction. Neatly sketch the details. [20]

7.a) How are shells different from folded plates?
b) Explain the structural behaviour of shells.
c) With the help of neat sketches illustrate the different types of shell structures. [4+6+10]

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Set No.3

Code No: RR420108

IV B.Tech II Semester Supplementary Examinations, June 2007
ADVANCED STRUCTURAL ENGINEERING
(Civil Engineering)

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

Answer any FOUR questions
All Questions carry equal marks
Assume suitable data whatever necessary
Use of I.S. codes and Structural Tables is permitted.

1.a) What is the advantage of Airy's formula over Janssen's formula. Discuss the formula for the two cases arising in practice.

b) Find out the vertical load taken by the shallow and deep portions of a silo 20 m in height and 6m diameter, storing wheat having unit weight 8 kN/m^3, using Airy's theory. Find the horizontal pressures at 5 m intervals. [10+10]

2. Design the hopper bottom of a square bunker (2.5m x 2.5m) having 45^o slope and central square opening (0.5 x 0.5m), to store coal having unit weight 8 kN/m^3 and angle of repose of 30^o. Use M-20 grade concrete and Fe-415 grade steel. Sketch the details of reinforcement. [20]

3. With the help of neat sketches, illustrate the details of reinforcement in R.C. chimney along with flue-opening details and support for brick lining. [20]

4. Design an R.C. grid floor (9m x 12m) for an assembly hall if the rib spacing is 1.5 m c/c, live load 4 kN/m^2. Adopt M-20 grade concrete and HYSD bars. Sketch the reinforcement details. [20]

5. Design the deck slab of a composite bridge deck using R.C. slab and plate girder for a highway and bridge of span 12 m if the clear width of loading =7.5 m. The spacing of longitudinal girder = 1.75 m c/c and that of the cross-girder = 3.5 m. Live load = IRC class AA trached vehicle. Use M –30 grade concrete and HYSD bars. [20]

Contd…2

6. Design the shear connectors for an R.C deck and I-girder 500mm wide, 1000 mm deep web, thickness of flanges 30 mm, width of web 10mm, thickness of deck slab 300 mm for the following data:
   A = 77,200 mm^2
   I = 271 x $10^{10} mm^4$
   V = 550 kN
   a = 46200 mm^2
   $\bar{y}$ = 210 mm.
   Find the shear stress and total S.F. at junction. Find the capacity of one 30 mm stud and the no. of studs required in a row. Sketch the details. [20]

7. Write short notes on:
   a) Types of Folded plates
   b) Standard behavior of shells
   c) Temperature stresses in R.C. chimney. [20]

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Set No.4

Code No: RR420108

IV B.Tech II Semester Supplementary Examinations, June 2007
ADVANCED STRUCTURAL ENGINEERING
(Civil Engineering)

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

Answer any FOUR questions
All Questions carry equal marks
Assume suitable data whatever necessary
Use of I.S. codes and Structural Tables is permitted.

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1. Design the conical bottom of an R.C. silo 18m height of cylindrical portion having 6m diameter, to store wheat having unit weight 5 kN/m^2. The conical bottom has 45^o slope and central opening of 500 mm diameter. Use M-20 grade concrete and HYSD bars. Sketch the details of reinforcement. [20]

2. Fix up the dimensions of a bunker with hopper bottom to store 200 kN of coal having unit weight of 8 kN/m^3. Design the side walls if the angle of repose of coal is 30^o. Use M-20 grade concrete and Fe-415 grade steel. Sketch the reinforcement details. [20]

3. Check the stresses at the base of an R.C. chimney of 60 m height and 4m external diameter, subjected to uniform wind pressure of 1.5 kN/m^2. 10 cm brick lining is provided at 10 m intervals. An air gaps of 150 mm is provided. Use Fe-415 grade steel and M-25 grade concrete. [20]

4. Analyse the R.C. grid floor roof covering an area of 10m x 14m, the spacing of ribs in mutually perpendicular directions being 2m c/c. The live load = 1.5 kN/m^3. Use M-20 grade concrete and HYSD bars. Obtain suitable reinforcement in the rib and slab and sketch the details. [20]

5. A composite bridge deck consisting of R.C. slab and steel girder is to be designed for a national highway of span 20m. The clear width of roadway = 7.5m.. There is a 1m wide footpath on either side. The spacing of longitudinal girder is 2m c/c and cross girder 4mm c/c. live load: IRC class A. Adopt M-30 grade concrete and Fe 415 grade steel. Sketch details. [20]

6. Illustrate the analysis and design of shear connectors in a composite bridge deck by taking a suitable example. [20]

7.a) What is the structural difference between plates, folded plates and shells.
b) Explain the behaviour of folded plates.
c) With sketches explain the different types of folded plates. [6+4+10]

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