Registration no:

7th Semester Regular / Back Examination 2015-16
DESIGN OF ADVANCED CONCRETE STRUCTURES
BRANCH: Civil
Time: 3 Hours
Max marks: 70
Q.CODE: T576
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.
Use of relevant IS Codes is allowed during the examination.

Q1   Answer the following questions: **(2 x 10)**
  a) State the controlling parameters for the structures when subjected to minor, moderate and severe earthquake impact.
  b) What is Bauschinger effect? Explain.
  c) Distinguish between load bearing wall system and frame structure system.
  d) What is the purpose of providing retaining walls?
  e) Draw the vertical section of a counterfort retaining wall and show the different components.
  f) Define a *slab culvert*.
  g) State the formula and draw a figure to show the *dispersion length* of a wheel load system along the span as a function of the length of the tyre contact.
  h) Why, high strength concrete is opted in pre stressing?
  i) *Prestressing* is also called as *reverse stressing*? Why?
  j) For a rectangular water tank resting on ground, draw a diagram to show the loads shared by horizontal frame action and horizontal cantilever action.

Q2   Calculate the minimum and maximum soil pressure at the base slab for   **(10)**
         a cantilever retaining wall based on the input data given below.
         Thickness of slab base = 500 mm, thickness of stem = 400 mm.,
         height of embankment above GL = 4 m, density of soil = 18 kN/cubic m,
         SBC of soil = 200 kN/sq m, angle of repose = 30 degree, coeff of
         friction = 0.4. Assume any other data, if required. Draw also the
         pressure diagram for the base slab

Q3   Design the long wall of an open rectangular water tank of size 4mx9m   **(10)**
         c/s area and 3m deep, resting on ground using M20 concrete and
         Fe415 steel. Show the reinforcement detailing. Assume any other data
         if required.

Q4 A four storied office building is to be constructed in Cuttack on hard soil. Find the lateral forces and storey shears in an outer frame due to earthquake loading using the data given below. **(10)**

Bay width = 5 m centre to centre, frame spacing = 7 m centre to centre, floor thickness = 20 cms, outer columns = 40 cms x 40 cms, inner columns = 30cms x 30 cms, girders below floor slab = 30 cms x 40 cms, Live load = 2 kN/m^2 , damping = 5%, reduced level of ground, 1st, 2nd, and roof level are 50m, 53m, 56m and 60 m, respectively.

Q5 a) Define a slab culvert. Draw the plan and elevation of a slab culvert and show various substructure and superstructure components. **(5)**

b) What do you mean by impact loading? How is it taken into account in the analysis of bridges based on IRC loading? **(5)**

Q6 a) Explain the types of IRC loadings. What is the objective of adopting IRC loading instead of any other loading? **(2+2)**

b) Draw the plan of a IRC class AA wheeled vehicle system showing all the wheel locations, wheel dimensions, ground contact dimensions, clear spacing between the wheels in transverse and longitudinal direction and other details. **(6)**

Q7 A rectangular simply supported pre stressed concrete beam having span length of 6 m and c/s area of 125 mm by 250 mm is prestressed by a force of 250 kN applied through a horizontal tendon at an eccentricity of 60 mm below the neutral axis which is parallel to the span . The beam carries a uniformly distributed load of 5 kN/m for the left half of the span in addition to its own weight. Find the resultant stresses at extreme top and extreme bottom at a distance of 4m from the left end of the beam. Draw three separate stress diagrams and the resultant stress diagram. **(10)**

Q8 Write short notes on any two: **(5 x 2)**
a) Cyclic behavior of reinforcing steel
b) Stability requirement for a cantilever retaining wall
c) Pre tensioning and post tensioning
d) Loads and forces acting on bridges