Registration No. : | | | | | | | | | | |

*Total number of printed pages – 2*

**B. Tech**

**PECI 5403**

# Seventh Semester Back Examination – 2014

## DESIGN OF ADVANCED CONCRETE STRUCTURES

**BRANCH : CIVIL**

**QUESTION CODE : L 190**

**Full Marks – 70**

**Time : 3 Hours**



*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 and IRC Codes are allowed.*

1. Answer the following questions : 2×10
   (a) Distinguish between active earth pressure and passive earth pressure as applicable for retaining walls. Draw suitable figure to explain it.
   (b) Draw the elevation of a counterfort retaining wall and show different components.
   (c) What do you mean by Importance Factor in earthquake resistant design of structures ?
   (d) Distinguish between minor, major and moderate earthquakes.
   (e) Explain why high strength steel is used in prestressed concrete.
   (f) State the salient features of IRC AA loading.
   (g) What are the various factors which influence the ductility of a structure ?
   (h) State the various types of forces and loads which act on a simply supported slab culvert bridge ?
   (i) Name the various IS codes which are used for earthquake resistant design of structures.
   (j) State the various types of loads and forces which act on a bridge structure.
2. Design the stem of a cantilever retaining wall of 5 m height above ground level with angle of repose of 30 degree. The density of soil at site is 18 kN/cubic metre and the safe bearing capacity of soil is 140 kN/cubic metre. The coefficient of friction between soil and concrete as 0.55. Use M20 concrete and Fe 415 steel. Assume suitable additional data, if required. 10

**P.T.O.**

3. A simply supported rectangular concrete beam, 150 mm wide and 300 mm deep is having a span length of 6 m carrying a live load of 3 kN/m in addition to its dead load. It carries an effective prestressing force of 250 kN through a horizontal tendon located at an eccentricity of 30 mm below the neutral axis. The beam also carries a concentrated load of 5 kN at a distance of 2 m from left end. Calculate the resultant stresses at extreme top and extreme bottom at a section, 4 m from left end. 10

4. Find the design shear force for the RCC slab culvert as per the following data.
Carriage way two lane = 7.5 m wide, Clear span = 6.0 m, Wearing coat = 80 mm
Width of bearing = 350 mm, Diameter of reinforcement bars = 28 mm
Loading on bridge = IRC Class AA wheeled. Draw suitable figures to calculate the required values. 10

5. A three storied office building 24 m × 24 m is to be constructed in Sambalpur on rocky soil. Calculate the lateral force and storey shears in an external corner frame due to earthquake loading adopting the following data.
Bay width = 4m centre to centre, frame spacing = 6 m centre to centre
Floor thickness including finish = 30 cms, Outer columns = 35 cms × 35 cms
Inner columns = 45cms x 45 cms, Girders below floor slab = 30 cms × 40 cms
Live load = 3 kN/m$^2$. Asume any other data if required. 10

6. A prestressed concrete beam of section 200 mm wide by 300 mm deep having an effective span of 8m carries a live load of 5.0 kN/m. Calculate the maximum and minimum resultant stresses at a distance 3 m from left end. The beam is subjected to a concentric prestressing force of 100 kN over a horizontal cable. 10

7. (a) Explain the types of losses which occur for pretensioned prestressd concrete members. Derive the loss due to elastic deformation of concrete. 5

   (b) A pre tensioned beam of 150 mm wide and 300 mm deep is prestressed by 8 wires of 6 mm diameter initially stressed to 1000 N/sq mm with their centroid at a distance of 40 mm below the neutral axis. Calculate the maximum stress in concrete immediately after transfer allowing the loss due to elastic deformation of concrete. 5

8. Write short notes on the following : 3.33×3
   (a) Concept of ductility in RCC members
   (b) Stability requirements for a retaining wall
   (c) Pretensioning and post tensioning.