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Total number of printed pages – 3

B. Tech
PECI 5403

Seventh Semester Examination – 2013
DESIGN OF ADVANCED CONCRETE STRUCTURES

BRANCH : CIVIL

QUESTION CODE : C-173

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.

Relevant IS Codes are allowed for use during the examination.

1. Answer the following questions : 2×10
- Distinguish among *minor*, *moderate* and *major* earthquakes.
 - Define *ductility* of RCC members.
 - State the various methods used to determine the design earthquake forces.
 - Draw the c/s of a cantilever retaining wall and show the various components.
 - What are various forces which act on a retaining wall ? Differentiate between *isotropic* and *anisotropic* materials.
 - Differentiate between cantilever retaining wall and counterfort retaining wall.
 - Explain the basic concept of prestressing briefly.
 - Why high strength steel is used in prestressing ?
 - Classify the type of IRC loading.
 - State the various types of loads and forces which act on a bridge structure.
2. Design the stem portion of a cantilever retaining wall using the data given below. Show the reinforcement detailing.
- Height of embankment above GL = 3.5 m. Density of soil = 16 kN/cubic m. SBC of soil = 180 kN/sq m, angle of repose = 30 degree. Coefficient of friction = 0.4, Assume M20 concrete and Fe 415 steel. 10

P.T.O.

3. Calculate the minimum and maximum soil pressure at the base slab for the cantilever retaining wall using the same data as given in Q 2. Assume the thickness of slab base as 500 mm. Draw the pressure diagram for the base slab.

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4. A three storied office building 30 m × 30 m is to be constructed in Bhubaneswar on hard soil. Find the lateral forces and storey shears in an outer frame due to earthquake loading using the data given below.

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Bay width = 6 m centre to centre Frame spacing = 8 m centre to centre

Floor thickness including finish = 20 cms

Outer columns = 40 cms × 40 cms

Inner columns = 30 cms × 30 cms

Girders below floor slab = 30 cms × 40 cms

Live load = 3 kN/m²

Damping = 5%

Reduced level of ground, 1st, 2nd, and roof level are 100 m, 104 m, 107 m, 111 m, respectively.

5. A RCC slab culvert is to be constructed for a National Highway to suit the following data :

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Carriage way two lane = 7.5 m wide, Clear span = 6 m

Wearing coat = 75 mm, Width of bearing = 300 mm, Find the live load maximum factored moment considering Class AA tracked vehicle. Show the loading position.

6. (a) Classify the various types of losses for pretensioned members and post tensioned members. Describe the steps to calculate the loss of stress due to elastic deformation of concrete for each type of member.
- (b) Distinguish between pretensioning and posttensioning.

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7. A prestressed concrete beam of section 150 mm wide by 300 mm deep having an effective span of 5 m carries a live load of 3 kN/m including its dead load and a concentrated load of 5 kN at 2 m from left end. Find the magnitude of concentric prestressing force necessary to cause zero tensile stress at the soffit of the beam at the centre of span section. 10
8. Write short notes on any **four** of the following : 2.5×4
- (a) Cyclic behavior of concrete
 - (b) Displacement ductility and strain ductility
 - (c) Stability requirement of a retaining wall
 - (d) Types of bridges
 - (e) Elevated water tank
 - (f) Shear key.

