

B. Tech (Civil) [Final]
Structural Design -III
(CE 402)
(END Semester Examination)

Duration: 3 Hrs.**Date: 27/11/2012****Max. Marks: 50***Instructions to candidate:*

- 1) All questions are compulsory.
- 2) Assume suitable data, if necessary.
- 3) Use of non-programmable electronic calculators is allowed.
- 4) Use of IS code 456 –2000, IS: 1893, 3370 is permitted.

Q.1

- a) Explain the behavior of reinforced concrete and prestressed concrete beam with reference to efficiency of material used, shear strength, serviceability and economy. Please avoid vague statement.
- b) What are the shortcomings of prestressed concrete over the steel or reinforced concrete structure?
- c) What are the different stages of loading in prestressed concrete?
- d) What are IS recommendations in respect of depth of various types of beams /slabs based on stiffness considerations?
- e) A cantilever slab of 3 m span is subjected to live load 3 kN/sq.m and located in *seismic zone V*, design the slab as per codal provisions.

[10]**Q.2**

A post tensioned prestressed concrete beam is supported on two supports, A and B at 10 m apart with an overhang of 5 m beyond support B. It is subjected to dead load [excluding self wt] 10 kN/m and live load of 5 kN/m. The specified 28-days cube strength is 50 N/sq.mm. Assume ultimate tensile stress in prestressing steel is equal to 1600 N/sq.mm & prestress loss ratio = 0.80. Determine the cross section [T section] and profile of the prestressing cable. Sketch the cable profile making the eccentricity of cable at the support and free end.

(10)**Q.3**

Determine the loss of prestress due to elastic shortening in pre-tensioned beam whose cross section is as below.

Unsymmetrical I section :

Top flange = 1000 mm x 150 mm

Web = 150 mm x 800 mm

Bottom flange = 500 mm x 150 mm

Overall Depth = 1100 mm

Four cables ,each of 12/7 with initial prestress of 1100 N/sq.mm at a constant eccentricity are located at 100 mm , 200 mm , 300 mm and 1000 mm from soffit of the beam .

If above beam is post-tensioned and cables are tensioned in sequence , find the loss of prestress due to elastic shortening and stress in concrete at top and bottom fiber.

(10)

Q.4

Design a combined footing for three RC columns located at a distance 5.0 m c/c in a straight line.

- Column A = 900 mm x 900 mm, Axial load = 3000 kN , Moment due to seismic in each direction = 150 kN-m
- Column B = 600 mm x 600 mm, Axial load = 1600 kN. Moment due to seismic in each direction = 100 kN-m
- Column C = 600 mm x 600 mm Axial load of 1600 kN. Moment due to seismic in each direction = 100 kN-m
- Column C is touching the property line on one side.
- Use SBC of soil = 90 kN/sq.m and M-30 and Fe 500.
- Show the details of reinforcement.

[10]

Q. 5

A water tank is resting on ground and it has large capacity.

Internal Dimension = 100 m x 60 m open to sky.

Water depth in tank = 4.0 m

Free board = 0.5 m

SBC of soil = 500 kN/sq.m

Use IS: 3370, M-30 and Fe415.

Your design calculation should cover the following,

[a] Design of vertical wall only

[b] The details of reinforcement in wall.

If quality of concrete differs by 40 %, then redesign the section.

[10]