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Total Number of Pages: 02

M.TECH
CEPC202

2ndSem Regular / Back Examination – 2015-16
ADVANCED REINFORCED CONCRETE DESIGN
Q.CODE:W771
Time: 3 Hours
Max marks: 70

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.
(Use of IS 456-2000 and SP-16 is permitted)

- Q1 Answer the following questions: (2 x 10)
- State the essential difference between limit state and working stress design philosophies?
 - Why is it necessary to provide transverse reinforcement in one way slab?
 - What are positive and negative yield lines?
 - What are the roles of concrete in tension zone?
 - Show with the help of a diagram the shear transfer mechanism.
 - Why is it necessary to limit deflections in RC flexural members?
 - Distinguish between short term and long term deflections.
 - What is slenderness ratio?
 - Show with the help of a diagram the major and minor axes of a column section.
 - When do we refer the interaction diagrams?
- Q2 a) Design a simply supported isotropically reinforced square slab of side 3.0m to carry a service load 3.5 kN/m^2 . Use yield line theory, M_{20} concrete and Fe_{415} steel. (5)
- b) Draw the reinforcement details as per codal requirements. (5)
- Q3 Determine the reinforcements required for a column of size 350mm x 400mm which is restrained against sway, bent in double curvature and there is equal distribution of reinforcement on all sides using the following data: (10)
- Effective lengths in x and y directions are 5.5m and 4.5m. Unsupported length is 6.5m.
Factored Load is 1400 kN. Use concrete grade M_{25} and steel Fe_{415} .
Factored moment in the direction of larger dimension: 40 kN-m at top and 30 kN-m at bottom
Factored moment in the direction of shorter dimension: 30 kN-m at top and 20 kN-m at bottom.

- Q4 A simply supported beam is of effective span 6.0 m. whose depth is limited to 450mm. (10)
The live load on the beam is 40 KN/m. There are two concentrated loads of 25KN at
one third span points from both ends of the beam. Design the flexural reinforcements
taking M_{25} concrete and Fe_{415} steel with severe exposure conditions. Perform checks
as usual.
- Q5 a) Design the shear reinforcement of the beam in Q. No. 4 assuming Fe_{415} steel for (5)
shear reinforcement. Provide adequate curtailment of bars.
b) Apply necessary checks for the above shear design. (5)
- Q6 a) How is the short term deflection due to live loads alone estimated? What is its (5)
relevance?
b) Explain clearly the difference in the behavior of one way and two way slabs. (5)
- Q7 A rectangular beam of 300mm wide and 600mm deep is subjected to an ultimate (10)
twisting moment of 110kN-m combined with an ultimate (hogging) bending moment of
140 kN-m and an ultimate shear force of 90 kN. Design the torsional reinforcements.
Assume M_{25} concrete, Fe_{415} steel and moderate exposure conditions. Perform checks
as usual.
- Q8 Write Short Notes (Any Two) (5 x 2)
a) Plastic hinge
b) Compatibility Torsion
c) Guidelines for Yield line patterns
d) Corner reinforcements in slabs