Question Paper

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNAIONAL CENTRE FOR APPLIED SCIENCES
IV SEMESTER B.S.(ENGG.)
END - SEMESTER THEORY EXAMINATIONS APRIL-2018
DATE : 16, APRIL 2018
TIME : 9:30AM -12:30PM
Basic Concrete Design [CE 243]

Marks: 100   **Duration: 180 mins.**

Answer 5 out of 8 questions.

Additional data if required may be assumed suitably and indicated.

Reference to IS-456 : 2000 and SP - 16 is permitted.

Solve questions 1 and 2 by working stress method and remaining questions by Limit state Method

1)

A) Calculate the design constants for the following materials considering the balanced design for singly reinforced section. The materials are M20 grade concrete and Fe415 HYSD steel reinforcement. (10)

B) Find the moment of resistance of beam section of dimension 230mm wide X 480mm effective depth reinforced with 2no's of bars of 16mm diameter. Also state whether the beam is under reinforced or over reinforced. The materials used are M20 grade concrete and HYSD reinforcement of grade Fe415 (10)

2)

A)) Write five assumptions of straight line theory and explain the following:
a) Balanced section.
b) Under-reinforced section (10)

B) A rectangular cantilever beam of size 230mm width X 500mm effective depth is subjected to a bending moment of 85kNm. Design the reinforcement for flexure. The materials are M20 grade concrete and HYSD reinforcement of grade Fe 415. Assume effective cover of compressive (10)

reinforcement as 40mm.

3)

A) A singly reinforced rectangular beam is subjected to a bending moment of 30kN-m at working loads. The width of beam is 200mm. Find the depth and steel area for balanced section. The materials are M20 grade concrete and mild steel reinforcement. (10)

B) Find the factored moment of resistance of a beam section 230mm wide X 420mm effective depth reinforced with 2-16mm diameter bars as compression reinforcement at an effective cover of 40mm and 4-20mm diameter bars as tension reinforcement. The materials are M20 grade concrete and mild steel reinforcement (10)

4)

A) Explain the following:
i) Nominal shear stress   (5 marks)
ii) Design shear strength of concrete   (5 marks) (10)

B) A reinforced concrete beam has a support section with a width of 250mm and effective depth of 500mm. The support section is reinforced with 3 bars of 20mm diameter on tension side. 8mm diameter 2 legged stirrups are provided at a spacing of 200mm center to center. Using M20 grade concrete and Fe 415 HYSD bars, calculate the shear strength of the support section. (10)

5)

A) Explain the importance of development length in structural members. Calculate the anchorage length of 20mm diameter bar of grade Fe500 in direct compression in concrete of grade M25. Assume Stress in steel (σs) = 0.75fy. (10)

B) Design a one-way slab with a clear span of 3.1m, simply supported on 200 mm thick laterite masonry wall to support a live load of 3kN/sqm and floor finish of 1kN/sqm. Adopt M20 grade concrete and Fe415 HYSD steel reinforcements. (10)

6)

A) Explain Characteristic loads, characteristic strength of materials and Partial safety factors (9)

B) Calculate short term deflection for simply supported beam carrying total factored load of 10kN/m (inclusive of its self-weight). The beam has a cross-section of 230mm width and 500mm overall depth and is reinforced with 4 bars of 16mm dia at tension side. The beam has an effective span of 6m. The material is M25 grade concrete and Fe 415 steel. Assume effective cover as (11)

40mm.

7)

A) Explain the following: (10)
 a) Cracking   b) Long term deflections

B) Calculate deflection due to shrinkage for simply supported (10) beam carrying total factored load of 30kN/m (inclusive of its self-weight). The beam has a cross-section of 230mm width and 600mm overall depth and is reinforced with 4 bars of 16mm dia at tension side and 2bars of 12mm dia at compression side. The beam has an effective span of 6.5m. The material is M25 grade concrete and Fe 415 steel. Assume effective cover as 40mm.

8)

A) Explain the major differences between short column and (10) long column.

B) A Short RCC column is to carry a factored axial load of (10) 1600kN having unsupported length of 3m. If the column is to be square, design the column and provide transverse reinforcement in the form of lateral ties. Assume emin $\leq$ 0.05D. The materials are M20 grade concrete and HYSD reinforcement of grade Fe415.

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