Question Paper

Exam Date & Time: 14-Nov-2019 (02:00 PM - 05:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENES
END SEMESTER THEORY EXAMINATIONS- NOV 2019
III SEMESTER B.Sc.(Applied Sciences) IN ENGINEERING
BASIC REINFORCED CONCRETE DESIGN [ICE 231 - S2]

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

Answer 5 out of 7 questions.

(1)Answer any five questions, each question carries 20 Marks
(2)Adopt working stress method for first two problems. For other problems, use limit state method unless it is specified.

1) Explain modular ratio. Also write an expression for neutral axis depth,lever arm and moment of resistance. (10)

A) A rectangular beam section 300 x 550 mm effective depth is reinforced with 4-16 mm bars on tension side.The permissible stress in concrete in bending compression and steel in tension are respectively 7.0N/mm^2 and 230 N/mm^2. Calculate moment of resistance. **Use Working stress Method.**

B) A cantilever beam of 2.5 m span carries an udl of 20 kN/m inclusive of its self weight . Design the beam for flexure, if it is reinforced in tension only. The width of the beam is half the effective depth of the beam. The materials are M20 grade concrete and Fe 415 grade steel. **Use working stress method** (10)

2) A rectangular beam 230mm wide x 400 mm effective depth is reinforced with 3-16mm bars at bottom(On tension side) and 2-12 mm bars on compression side.The effective cover of compression reinforcement is 40 mm. Find out the type of beam and find moment of resistance. The materials are M20 grade concrete and Fe 415 steel. (10)

A)

B) If the above beam 230 mm x 400 mm effective depth with the same reinforcement is subjected to a moment of 28 kNm.find the maximum stress in the concrete and tension steel.Also findout the allowable udl on a simply supported beam of effective length 4m.. **Use working stress method.** (10)

3) A singly reinforced rectangular beam is subjected to a bending moment of36 kNm at working loads. The widh of the beam is 200 mm.Find the depth and steel area for the balanced section.The materials used are M20 gade concrete and Fe415 grade steel.**Use Limit state Method.** (10)

A)

B) Estimate reinforcements for a simply supported one-way slab of span 3.3m. carrying a uniformly distributed live load of 2.0 kN/m^2.Assume a floor finish load of 0.5 kN/m^2.Thickness of the slab is 100 mm. The materials are M20 (10)

grade concrete and Fe415 grade steel.

4) Design the end span of a continuous beam having an effective span of 5m carrying a factored dead load of 30kN/m and factored live load of 18kN/m. Carryout all the necessary checks as per IS:456-2000. The grade of concrete is M20 and grade of steel is Fe415, the beam is located in mild exposure condition and assume breadth of the beam as 250mm. (20)

5) A two way slab has to be designed for a room of size 3.9 x 5.1 m ,resting on a masonry wall of 230 mm width .All the four edges of the slab are discontinuous.Assume a live load of 2 kN/m^2 and a floor finish of 0.6 kN/m^2.adopt M25 concrete and Fe 415 grade steel. (20)

6) A) Find the long term deflection due to shrinkage for simply supported beam carrying total load of (DL+LL) of 3**0kN/m.** Beam of **250mmx600mm** overall depth is reinforced with **4 bars of 16mm** diameter on the tension side and **2 bars of 16mm** diameter on compression side. The beam has an effective span of 6m. Assume **M 20** grade of concrete, **Fe 415** steel and effective cover as **50mm.** (**Use working stress method)** (10)

B) An axially loaded column is subjected to a load and uniaxial bending moment of 1500kN and 200 kNm.respectively about the **minor** axis.The size of the column is 300 x 600 mm using M25 grade concrete and Fe415 grade steel. Find steel. (10)

7) A) Calculate short term deflection for simply supported beam carrying total load due to (DL+LL) of **30kN/m** (inclusive of its self-weight). The beam dimensions are **250mmx600mm** overall depth and is reinforced with **4 bars of 16mm** diameter on the tension side. The beam has an effective span of **6.5m,** grade of concrete is **M25** and grade of steel is **Fe415**. Assume effective cover as **40mm.** (12)

B) Explain the design steps for axially loaded column footing and cracking of concrete. (8)

-----End-----