

MANIPAL INSTITUTE OF TECHNOLOGY

A Constituent Institution of Manipal University

## IV SEMESTER B.TECH. (CIVIL ENGINEERING)

### END SEMESTER EXAMINATIONS, APRIL/MAY 2017

## SUBJECT: BASIC REINFFORCED CONCRETE DESIGN [CIE 2203]

## **REVISED CREDIT SYSTEM**

#### ( / /2017)

Time: 3 Hours

MAX. MARKS: 50

#### Instructions to Candidates:

- ✤ Answer ALL the questions.
- ✤ Missing data may be suitably assumed.
- ♦ Usage of **IS :456 -2000** and **SP-16** is permitted.
- ✤ Use Limit State Method of Design unless specifically mentioned

1A.	A beam is <b>250 mm</b> wide and <b>550 mm</b> effective depth, calculate the design constants, if <b>M 20</b> grade concrete and <b>Fe 415</b> grade steel is used. (Use working stress method)	04
1B.	A rectangular beam has a cross section $300 \text{ mm} \times 550 \text{ mm}$ . It is reinforced with 4 <b>bars of 20 mm</b> diameter on its tension side and 2 <b>bars of 16 mm</b> diameter on compression side. Calculate the moment of resistance of the section. Use M 25 grade concrete and Fe415 grade steel. Effective cover for both compression and tension side is 45 mm. (Use working stress method)	06
2A.	A simply supported beam of <b>230 mm</b> wide and <b>550 mm</b> effective depth is reinforced with <b>3 bars of 20 mm</b> diameter on the tension side. Calculate the safe UDL including the self-weight over a span of <b>5 m</b> . The materials used are <b>M 20</b> grade concrete and <b>Fe 415</b> grade steel.	04
2B.	Calculate the moment of resistance of a T-beam with a slab thickness of <b>120 mm</b> , effective flange width of <b>2500 mm</b> , breadth of web is <b>230 mm</b> and effective depth of the beam is <b>600 mm</b> . It is reinforced with <b>3 bars of 16 mm</b> diameter on the tension side. The materials used are <b>M 20</b> grade concrete and <b>Fe 415</b> steel.	06
3A.	Differentiate between under reinforced and over reinforced beam sections	02
3B.	A rectangular beam section of size 250X650mm overall depth is subjected to a factored bending moment of 55 kN-m, factored shear force of 50 kN and factored torsional moment of 25 kN-m. Design the torsion reinforcement, use M 20 grade concrete and Fe 415 steel. The exposure condition is moderate.	08
4.	Design a two-way slab for a room measuring <b>4mX6m</b> supported on brick masonry wall width of <b>230 mm</b> . The slab is restrained at the corners and two short edges are dis-continuous. The live load on slab is <b>2.5kN/m<sup>2</sup></b> and floor finish of <b>1 kN/m<sup>2</sup></b> . Do all necessary checks as per IS:456 2000. Adopt <b>M 20</b> grade concrete and <b>Fe 415</b> grade steel. Consider moderate exposure condition and Sketch the reinforcement details.	10

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5A.	Design a short column of size <b>350mmx650mm</b> subjected to a factored load of <b>2000kN</b> and bending moment of <b>250kN-m</b> about major axis. The materials are <b>M 25</b> grade concrete and reinforcement of grade <b>Fe 415</b> .	04
5B.	A simply supported rectangular beam of $300 \text{ mm} \times 550 \text{ mm}$ overall depth is reinforced with 4 bars of 16mm diameter as main reinforcement at tension face with an effective cover of 40mm. The hanger bars are 2 numbers of 12mm diameter at the compression face and bending moment applied on the beam is 160kN-m at working condition. Assuming M 40 concrete and Fe 415 steel, compute crack width at a point which is on the tension edge below the bar. Es = 200GPa. (Use working stress method)	06