Reg. No.										

MANIPAL UNIVERSITY

FOURTH SEMESTER B. ARCH. DEGREE EXAMINATION – APRIL/MAY 2014

SUBJECT: STRUCTURES IV (ARC-210)
(2007 & 2010 SCHEME)

Saturday, May 10, 2014

Time: 10:00-13:00 Hrs. Max. Marks: 50

- **Answer any FIVE full questions. Use of IS 456-2000 is permitted.**
- **Assume the following:**
  a) Permissible stress in concrete in bending compression for M15 grade is 5 N/mm^2 and for M20 grade is 7 N/mm^2
  b) Permissible stress in steel in tension **irrespective of bar diameter** is 140 N/mm^2 for Fe250 (mild steel) grade and 230 N/mm^2 for Fe415 grade steel
  c) Permissible compressive stress in concrete in direct compression is 4 N/mm^2 for M15 grade and 5 N/mm^2 for M20 grade
  d) Permissible stress in steel in direct compression is 130 N/mm^2 for Fe250 grade and 190 N/mm^2 for Fe415 grade

1A. What is reinforced cement concrete? What are the advantages and disadvantages of RCC construction?

1B. Explain the manufacturing process of ordinary Portland cement. Explain any two types of cements and their uses.

1C. What is slump test as applied to concrete? How is it carried out?

(3+4+3 = 10 marks)

2A. Determine the RCC constants for M20 concrete and Fe415 grade steel.

2B. A rectangular beam of width 300 mm and effective depth 650 mm is of M20 concrete and Fe415 steel. Determine its moment of resistance if there are 3 bars of 16 mm diameter provided on the tension side.

(4+6 = 10 marks)

3. An RCC beam of width 500 mm and overall depth 1000 mm is provided with six bars of 25 mm diameter on tension side and two bars of 20 mm diameter on compression side. An effective cover of 50 mm is provided at both top and bottom. Determine the moment capacity of the beam if M20 concrete and mild steel bars are used.

(10 marks)

4. A T beam section is having an effective flange width of 1200mm, flange depth of 100 mm, web width of 300 mm and an effective depth of 600 mm. If there are four bars of 25 mm diameter as tensile reinforcement, determine the stresses in concrete and steel under a

moment of 160 kNm. Also find the moment of resistance of the beam. Use M20 concrete and mild steel reinforcement.

(10 marks)

5. A reinforced concrete beam is supported on two walls 750 mm thick, spaced at clear distance of 6 m. The beam carries a superimposed load of 8 kN/m. Design the beam using M15 concrete and mild steel bars. Sketch the typical reinforcement details.

(10 marks)

6. A reinforced concrete tied column has to carry an axial load of 1500 kN. The length of the column is 9 m and the ends are restrained both in position and direction. Using M15 concrete and mild steel bars:

   i) Design the smallest square column

   ii) Design the most economical square column

   iii) Design a column of size 400 mm × 500 mm.

   Sketch the reinforcement details.

(10 marks)