MANIPAL UNIVERSITY

SEVENTH SEMESTER B. ARCH / B. ARCH (ID) DEGREE EXAMINATION – FEBRUARY 2016

SUBJECT: ARC 409 – STRUCTURES VII
(2010 SCHEME)

Saturday, February 20, 2016

Time: 14:00 – 17:00 Hrs.   Max. Marks: 50

- ✍ **Answer any FIVE FULL Questions. Missing data be suitably assumed.**
- ✍ **Support answers with neat sketches wherever appropriate.**
- ✍ **Use of IS 456 - 2000 allowed.**

1A. A rectangular concrete beam100mm wide × 250mm deep spanning over 8m is prestressed by a straight cable carrying an effective prestressing force of 250kN at an eccentricity of 40mm.The beam supports a live load of 2 kN /m. Determine the resultant stress distribution at mid span section.

1B. Citing examples, explain the relevance of cable profile in PSC beams.

$$(5+5 = 10 \text{ marks})$$

2A. Explain how do you find Mu of flanged beam.

2B. A singly reinforced rectangular beam of grade M20 has width 230mm and 460mm effective depth is reinforced with 4 bars of 16mm dia of Tor 40 grade. Determine the moment of resistance of the section.

$$(5+5 = 10 \text{ marks})$$

3A. Citing examples, explain the term "load balancing technique" as relevant to PSC beams.

3B. A PSC beam 300 mm wide & 700mm deep, spanning over 7m over simple support is loaded with concentrated load of 180 kN at midspan. The beam is provided with bent up cable concentric at the ends and central dip of 100mm. Given the effective prestress force as 1200kN, determine stress across the section at midspan.

$$(5+5 = 10 \text{ marks})$$

4A. Find the moment of resistance of a beam section 230mmwide × 500mm effective depth reinforced with 2#16 Φ in compression and 4#20 Φ in tension. Grade of concrete M25 grade &steel of Fe500 being used. Assume effective cover as 40mm.

4B. Explain why under reinforced doubly reinforced section is preferred in seismic resistant beam design.

$$(7+3 = 10 \text{ marks})$$

5A. A PSC beam of span "**L**" is loaded with a point load "**W**" & is provided with a bent cable carrying a prestress force "**P**". Determine the central dip "h", such that effect of point load is completely neutralized.

5B. Design & detail a RCC column to carry axial load of 1200 KN at service condition. Use M20 grade concrete and Fe415 grade steel.

$$(3+7 = 10 \text{ marks})$$

6. Design & detail a RCC simply supported beam for a span of 5m. Live load at working condition being 15kN/m. Use M25 concrete and Fe500 grade steel.

$$(10 \text{ marks})$$