(b) Design a RCC circular column of 2.75 m effective length to carry an axial load of 1600 kN. Use M–25 Concrete and Fe–415 Grade Steel.

(c) A short reinforced concrete rectangular of size 300 mm × 500 mm is subjected to an axial compressive factored load of 200 kN and a factored moment of 250 kNm about the major axis. Use M–25 Concrete and Fe–415 Grade Steel. Design the column by using the following chart.
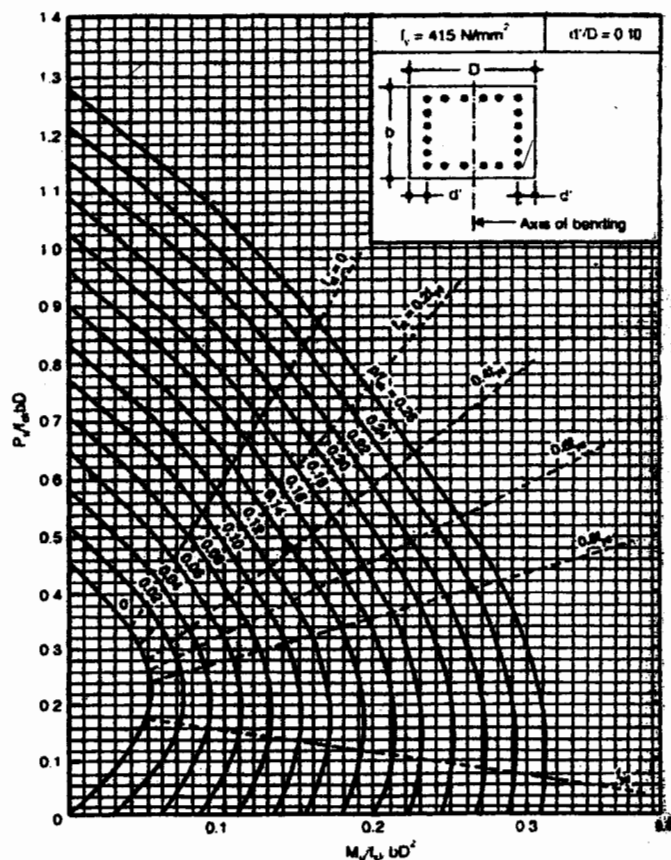
(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2134　Roll No. [　　　　　　　　　　]

B.Tech.
(SEM. V) THEORY EXAMINATION 2011-12
DESIGN OF CONCRETE STRUCTURES—I

Time : 3 Hours　　　　　*Total Marks : 100*

Note :— Attempt all the questions. All questions carry equal marks. Use of IS 456 is allowed. If required any missing data; then choose suitably.

1. Attempt any two parts of the following :　　(10×2=20)

(a) Describe the effect of following factors in the concrete mix design; water cement ratio, shape and size of coarse aggregate and exposure conditions.

(b) Explain transformed section for singly reinforced beam. Using WSM (working stress method) determine moment of resistance of a rectangular beam section 280 mm wide and 450 mm effective depth if reinforced with 3 bars of 16 mm diameter. Use M–25 concrete and Fe–415 steel.

(c) Design a beam section using WSM which is subjected to moment of 100 kNm. The size of beam is restricted to 230 mm width and 480 mm effective depth. Use M–20 concrete and Fe–415 steel.

2. Attempt any **two** parts of the following : (10×2=20)

(a) A simply supported beam of clear span 5 m has to carry a superimposed load of 45 kN/m at service. The beam has bearing of 400 mm at each end. Find the reinforcement required using LSM. Use M–20 concrete and Fe–415 steel.

(b) A T–beam of flange width 1000 mm, flange thickness 100 mm, effective depth 550 mm and rib width 275 mm, has to be designed as a balanced section. Determine the area of steel required and the limiting moment of resistance. Use M–20 concrete and Fe–415 steel.

(c) Under what circumstances a doubly reinforced beam is designed ? Describe the procedure of its design.

3. Attempt any **two** parts of the following : (10×2=20)

(a) A reinforced concrete T–beam section has a flange width of 1450 mm, a flange thickness of 100 mm, a rib width of 275 mm and an effective depth of 500 mm. The beam section is subjected to an ultimate shear force of 325 kN. Design the shear reinforcement. Use M–20 concrete and Fe–415 steel. The main tensile reinforcement consists of 4 bars of 25 mm diameter.

(b) A 250 mm wide and 450 mm overall deep beam is reinforced with 3 bars of 20 mm diameter of Fe–415 grade on tension side with an effective cover of 50 mm. Two legged 8 mm vertical stirrups are provided at 160 c/c. If one bar is bent up at the section at 45°, determine the design shear strength of the section. Assume M–20 grade concrete.

(c) Establish a relationship for determining the development length. Also describe flexural bond and anchorage bond in reinforced concrete.

4. Attempt any **two** parts of the following : (10×2=20)

(a) Design a continuous one way slab. It is continuous over T–beams spaced at 3.4 m interval. Assume live load 4 kN/m^2 and adopt M–20 concrete and Fe–415 steel. Also check for deflection and show reinforcement details.

(b) Design a RCC slab of effective size 4 m × 5 m resting all around with corners held down. It carries live load of 3200 N/m^2. Use M–20 concrete and Fe–415 steel. Sketch the reinforcement details.

(c) A rectangular beam section 200 mm wide and 450 mm overall depth is reinforced with 3 bars of 16 mm diameter at an effective depth of 420 mm. Two hanger bars of 12 mm diameter are provided at the compression face. The effective span of the beam is 5 m. The beam supports a service load of 10 kN/m. If $f_{ck} = 20$ N/mm^2 and $f_y = 415$ N/mm^2 compute short term deflection.

5. Attempt any **two** parts of the following : (10×2=20)

(a) Design the reinforcements in a column of size 400 mm × 600 mm subjected to an axial working load of 1900 kN. The column has an unsupported length of 3 m and is braced against side way in both directions. Design the column using M–20 Concrete and Fe–415 Grade Steel.