at one-third points. The effective prestress is 1000 kN after all losses. Determine the value of equal point loads the beam can support at one-third points if the pressure line passes through the upper kern of the section.

4 Attempt any two : 10×2

(a) A column 45 cm x 45 cm in section and reinforced with 20 cm^2 longitudinal reinforcement is 1.5 m high. It is fixed at the bottom and is free at the top. Determine the safe axial load of the column.

(b) Draw axial force moment interaction curve for rectangular column with 3% steel distributed equally on two faces at an effective cover 0.15D.

(c) A square slab is simply supported on three sides and is free on the fourth side. Calculate the collapse load if the moment capacity in x-direction is twice of that in y-direction.

5 Attempt any two: 10×2

(a) Design a circular overhead water tank of 200 kL capacity over a staging of 25 m. Assume suitable proportions and prepare detailed structural drawings.

(b) A 200 mm thick section of a wall is subjected to a direct pull of 50 kN and a bending moment of 15 kNm in the horizontal plane. It is reinforced with 10 mm bars @125 mm c/c on each face. Find the maximum stresses in concrete and steel if concrete is of M25 grade and steel is H.S.D bars.

(c) Design a rectangular water tank of 250 kL capacity in space of 15 m x 5 m area. It is covered tank placed 1m below the ground level.

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Paper ID and Roll No. to be filled in your Answer Book

Roll No.

B. Tech.

(SEM.VI) (EVEN SEM.) EXAMINATION, 2013

DESIGN OF R.C. STRUCTURES

Time : 3 Hours] [Total Marks : 100

Note : Attempt all questions, the marks assigned to each question is indicated at question itself.

1 Attempt any four : 5×4

(a) What are the different limit states of design? What are the merits of limit state design philosophy over the other design philosophies?

(b) A continuous beam has two spans each of 10m. The characteristic dead load is 12 kN/m and the characteristic live load is 20 kN/m. Draw the bending moment envelope after maximum redistribution.

(c) Sketch the bending moment envelope after 30% maximum redistribution for a fixed ended beam carrying two point loads of 10 kN each of one third points and a uniformly distributed load of 2 kN/m over a span of 9m.

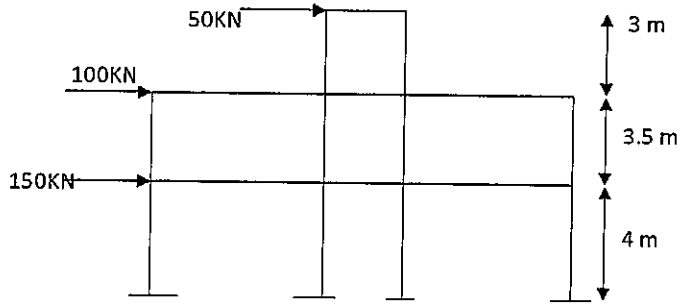
(d) Find the Moment of resistance of a beam section 25cm by 50cm deep if it is reinforced with 2-16mm bars in tension at an effective cover of 40 mm. Assume M-20 mix and Fe 500 Grade steel.

(e) A rectangular Reinforced Concrete beam is 25 cm wide and 40 cm (effective). If it has 2-25 mm TOR steel bars in compression at an effective cover of 40 mm, determine the additional moment of resistance provided by the compression steel. Assume same grade of steel in tension and M25 concrete.

(f) The flange of a T- beam is 125 cm x 10cm and the web below is 30 cm x 40 cm. It is reinforced with 3-20 mm, Fe 415 grade steel in compression. The clear cover to reinforcement is 25 mm. Determine the additional moment of resistance provided by the compression steel.

2 Attempt any four : 5×4

(a) Determine the member forces in the frame as shown. Assume area of each inner column is 1.5 times the area of each outer column. If the intensity of dead and live loads is 20 kN/m and 25 kN/m. Design the frame and draw the complete reinforcement details.



(b) Design a rectangular beam simply supported over a clear span of 6m, if superimposed load is 30 kN/m and support width is 50 cm each. Use M15 and TOR steel.

(c) Discuss the following in detail
- (i) Prestressed concrete and reinforced concrete.
- (ii) Merits and demerits of prestressed concrete.
- (iii) Pre- tensioning and post – tensioning .
- (iv) Loss of prestress.

(d) A beam is prestressed by a cable carrying an initial prestress of 750 N/mm^2. Calculate the percentage loss of prestress due to shrinkage of concrete if the beam is pre- tensioned and post-tensioned. Age of concrete at transfer = 8 days.

(e) A beam 30 cm x 45 cm section is prestressed at an constant eccentricity of 10 cm. If the net losses are 12% and final force of prestress is 750 kN, find the initial and final stresses due to prestress alone.

(f) Compute and draw the location of pressure line for a rectangular beam 30 cm x 45 cm which is prestressed with a force of 600kN at constant eccentricity of 8 cm. The beam carries uniform load of 20 kN/m over a span of 6m.

3 Attempt any two : 10×2

(a) Design a two – way slab supported on all four edges for a room 6 m x 4 m clear in size. The superimposed working load is 4 kN/m^2, and (i) corners are not held down and (ii) corners are held down.

(b) Design a roof slab for a room 5.4 m x 6.6 m clear in size to support a superimposed service load 5 kN/m^2 if two of its adjacent edges are continuous and the other two are discontinuous.

(c) A rectangular beam 20 cm x 45 cm has a span of 10 m. The prestressing cable has a trapezoidal profile with zero eccentricity at ends and 70 mm