Civil – Sem – VI – old – TRPC 09/05/15

QP Code : 4235

(OLD COURSE)

(3 Hours) [Total Marks : 100

N.B. : 1. Question no. 1 is compulsory.
Attempt any four out of remaining six questions.
2. Assume suitable data if necessary but justify the same.
3. Draw neat sketches wherever needed to support your solution.
4. Figures to the right indicate full marks.
5. Use of IS-456 is not permitted.

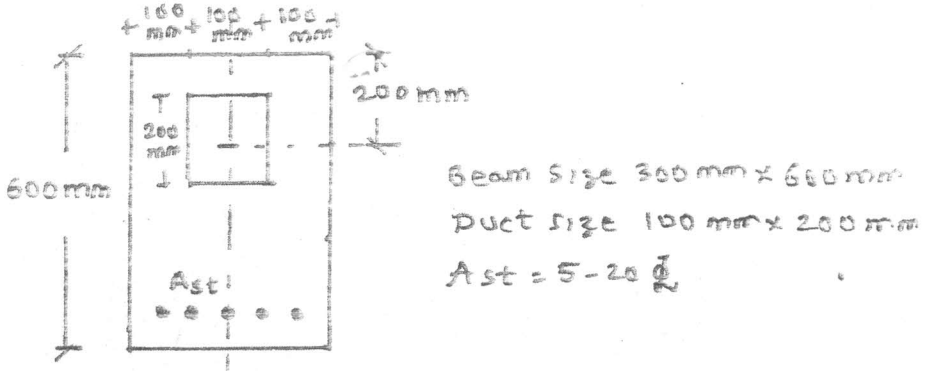
Q.1 (a) What is T-beam action? How will you calculate effective flange width b_f of a T-beam as per IS 456-2000? (5)

(b) Derive the expression for development length of plain bar in tension. Also write the code provision to use this expression for deformed bar under compression. (5)

(c) Write a short note on 'safe cable zone' in prestresssed concrete beam. (5)

(d) What is efficiency factor? Find its value for a prestressed concrete beam of circular cross section. (5)

Q.2(a) Figure shows the rectangular cross section of a RCC beam having a service duct. The size of this duct is 100 mm x 200 mm with its c.g. at 200 mm below the topmost fiber of beam section. Find MR of section if it is reinforced with 5 bars of 20 mm diameter at a clear cover of 30 mm Use concrete M20 and Steel of grade Fe415. (10)



(b) A RC beam of rectangular cross section 300 mm x 600 mm is reinforced with 5 bars of 20 mm dia on tension side and 4 bars of 16 mm dia on compression side, both at an effective cover of 40mm. Find the maximum stresses induced in concrete and steel (compression/tension) if the section is subjected to a sagging BM of 140 KN m. Adopt modular ratio m = 13.333. (10)

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Q.3 (a) A Tee beam section has following particulars-
Effective width of flange = 1400 mm, thickness of flange = 120 mm
Width of flange = 250 mm, Effective depth = 500 mm.
Determine amount of steel reinforcement if the beam section is subjected to BM of 170 KN m.
Use concrete M20 & steel Fe415. (10)

(b) Design a simply supported slab for a room of clear dimensions 3 m x 5 m. The slab is resting on 250 mm thick brick wall on all four sides. Assume live load = 3 KN/m^2 and floor finish load as 1 KN/m^2. Adopt concrete M20 & steel Fe415. Sketch the reinforcement details.
Use BM coefficients- $\alpha_x = 0.088$ and $\alpha_y = 0.057$. (10)

Q. 4(a) Design completely a helically reinforced short circular column to carry an axial load of 1200 KN. Use concrete M25 & steel Fe415. (10)

(b) A RC column of rectangular cross section is reinforced with 8 bars of 20 mm dia at 40 mm effective cover. It is subjected to an axial load P = 500 KN along with moments M_x = 50 KN m and My = 30 KN m. Check the suitability of section as uncracked.
Use concrete M20 & steel Fe415. (10)

Q.5 Design an isolated square pad footing to support a column of size 300 mm x 300 mm. The column carries an axial load of 600 KN.
Take SBC of soil = 170kN/m^2, concrete M20 and Fe415. (20)

Q.6 (a) Design the shear reinforcement for a RC beam of effective c/s 300 mm x 500 mm; subjected to a maximum shear force of 160 KN. The beam is reinforced with 4 bars of 25 mm diameter. Use concrete M20 & steel Fe415. Refer table below. (10)

100As / bd	0.50	0.75	1.00	1.25	1.50	1.75
τ_c (N/mm^2)	0.30	0.35	0.39	0.42	0.45	0.17

(b) A prestressed concrete beam of section 120 mm x 300 mm is used over a simply supported span of 6 m to carry a udl of 4 KN/m (inclusive of self weight). The beam is prestressed by a straight cable carrying an effective force of 200 KN, located at an eccentricity of 50 mm. Find the location of thrust line in the beam and plot its position at quarter & central span sections. (10)

Q.7 (a) State various types of losses in prestress. How will you calculate the loss in prestress due to elastic shortening of a PC member? (7)

(b) In a pre-stressed concrete beam of cross section 200 mm x 300 mm and span 6 meters, an initial prestressing force of 400 KN is applied at an eccentricity of 70 mm, by tendons of area 400 mm^2 . Assuming E_s =2 x 10^5 N/mm^2 and E_c = 0.333 x 10^5 N/mm^2 anchorage slip= 1.5 mm; creep coefficient in concrete ϕ = 1; shrinkage of concrete = 0.002 and creep loss in steel = 3%. Find the total % loss of stress in tendons. (13)