BTS(C) -V -05 – 061 (C)

B.Tech. Degree V Semester Examination, November 2005

CE 502 (A/B) DESIGN OF STRUCTURES I

(2002 Admissions)

Time: 3 Hours Maximum Marks: 100

(Use of IS456 and SP 16 permitted. All designs are to be in the Limit State Method)

I a) Explain the following terms:

i) Limit State Design ii) Ultimate load theory
iii) Elastic theory iv) Characteristic strength
v) Characteristic load vi) Partial safety factor
vii) Mu (lin) for Fe 250 and Fe 415 steels and M_{20} mix. (15)

b) Design a rectangular beam to resist a bending moment equal to 45kNm using
i) M_{15} mix and Fe 415 grade steel.
ii) M_{20} mix and Fe 415 grade steel (20)

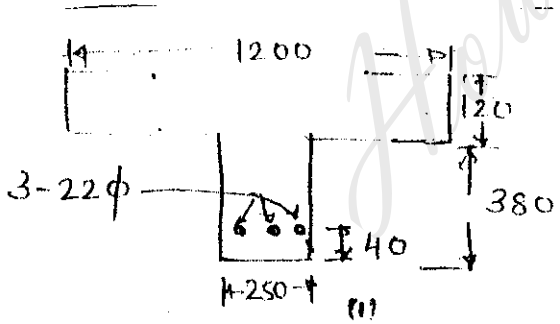
OR

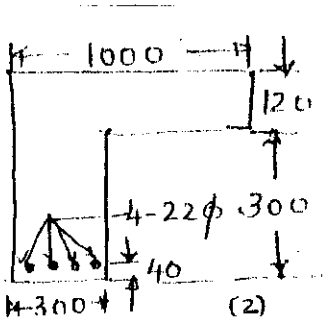
II a) Find the moment of resistance of a beam section 20cm by 60cm deep if it is reinforced with 2-20mm bar in compression and tension, each at an effective cover of 50mm. Use M_{15} mix and Fe 415 grade steel. (15)

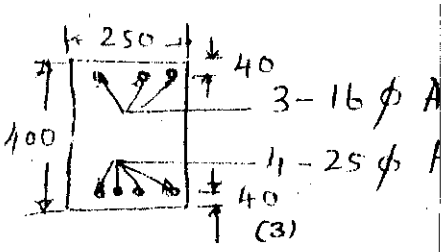
b) Design a double reinforced section for a rectangular beam and midspan having a simply supported effective span of 4^m. The super imposed load is 40kN/m and size of beam is limited to 25cm x 40cm overall. Assume suitable data. (20)

III a) Explain the following with sketches.
i) Diagonal tension failure
ii) Flexural shear failure
iii) Diagonal compression failure
iv) Typical failure modes in torsion. (12)

b) The beams shown in figures are subjected to factored shear force of 200kN. If σ_{CK} =20N/mm^2 and σ_Y =415N/mm^2. Calculate the shear reinforcement.





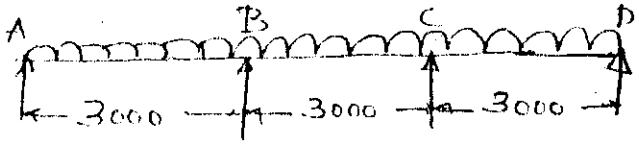


(23)

OR

IV a) A supply supported beam is 25 cm by 50 cm and has 2-20 mm TOR bars going into the support. If the shear force at the centre of support is 110kN at working loads, determine the anchorage length. Assume M_{20} mix and Fe 415 grade TOR steel. (10)

b) Design a continuous one-way slab having three equal spans of 3m each as shown in the figure with the following data: imposed load = 2.5kN/m^2. Use M_{15} and Fe 415 grade steel.



(25)

V a) Design a short column under biaxial bending with the following data:

Size of column	-	45 x 45 cm
Concrete grade	-	M_{15}
Steel grade	-	Fe 415
Factored load	-	P_u = 1000kN
Factored moment	-	M_{ux} = 75 kNm
		M_{uy} = 60 kNm

Moments due to minimum eccentricity are less than the values given above. Reinforcement is distributed equally on four sides. (15)

b) Design a circular column to carry an axial load of 1500kN using (i) lateral ties (ii) helical reinforcement. Use M_{25} mix and Fe 415 grade steel. (15)

OR

VI a) A 4m high column is effectively held in position at both ends and restrained against rotation at one end. Its diameter is restricted to 40cm. Calculate the reinforcement if it is required to carry a factored axial load of 1500 kN. Use M_{20} mix and Fe 250 grade steel. (10)

b) Design a stair flight for the staircase shown in the figure. Take superimposed loads as 5kN/m^2, $\sigma_{ck} = 20N/mm^2$ and $\sigma_y = 415N/mm^2$.