

DESIGN OF R.C.C. & STEEL STRUCTURE

Time Allowed: 2.5 Hours

Full Marks: 60

Answer to Question No. 1 is compulsory and Answer any Five (05) Questions from the rest. Use of IS 456-2000, SP-16, IS 800-2007 & SP 6(1) is allowed. Assume relevant data if required.

1. Answer any five in brief the following questions. 3x5=15
- i.) What is the value of partial safety factor for steel Structure design? Is it same as the value of partial safety factor for (DL+LL) combination? Can you tell when do under reinforced concrete section fails? Justify it.
 - ii.) Which type of reinforcement is provided to resist Diagonal tension in RCC beam? Write the structural advantage of using steel as a structural member with comparison to concrete.
 - iii.) Using strain diagram, find out the limiting depth of N. A. of a RCC rectangular section (bXD) for Fe-500 grade Steel. (Consider $D = d + d'$); where d is effective depth.
 - iv.) Define shape factor in plastic method of analysis of steel. Write the relation between plastic section modulus and plastic moment.
 - v.) How many maximum number of 20 mm dia bolts can be accommodated in one row in a 130mm wide flat connection? Sketch it with a lap connection.
 - vi.) When do you select doubly reinforced beams and why? Is there any relation between doubly reinforced and over reinforced concrete section?
 - vii.) The moment of resistance of T-beam is larger with respect to rectangular beam, justify it mathematically.
2. i. Calculate with L.S.M, the factored moment of resistance of a rectangular beam 250mm x 415mm(effective) reinforced with 3 nos of 20mm dia bar at tension. Use M20 Grade of concrete and Fe 415 grade of steel. (5+4)= 9
ii. Define Balanced section with strain diagram.
3. Design a rectangular simply supported beam for flexure and shear having a clear span of 6m to carry a uniformly distributed super imposed load of 15kN/m. Provided beam is supported on two masonry walls of 250 mm thick. Use M20 Grade of concrete and Fe 415 grade of steel. 9
4. i. Determine the factored moment of resistance of a beam of 250mm X 400mm (effective). The beam is reinforced with 2-16mm dia bar on compression side and 4-20 mm dia bar in tension side. The compression bars are placed at a distance of 40mm from top. Use M20 Grade of concrete and Fe 415 grade of steel.
ii. Determine the safe uniformly distributed load that the simply supported beam (250mm X 400mm), can carry having effective span of the beam is 6m. (5+4) = 9
5. Design a lintel both for flexure and shear over an opening of 1500mm wide over a Brick wall of width 250mm. Height of the roof above lintel is 2m. Use M20 Grade of concrete and Fe 415 grade of steel.
6. i. A single bolted double cover butt joint is used to connect two plates which are 8mm thick. Assuming M16 bolts of 4.6 grade and cover plates to be 6mm thick. Calculate the strength of the joint if 4 bolts are provided in the bolt line at a pitch of 45mm. (6+3)=9
ii. Determine the efficiency of the joint given in above problem.

7. i. State any two disadvantages and two disadvantages of any bolted connection.
ii. Determine the design bending strength of ISLB 350 @ 486 N/m considering the beam to be laterally supported. Assume steel grade as Fe 410. (4+5)=9
- 8 . i. Discuss the suitability of steel as reinforcement in RCC.
ii. List the different types of loads with relevant IS codes. 4+5 =9
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