SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code :DDRCS(13A01502) **Course & Branch**: B.Tech - CE

Year & Sem: III-B.Tech & I-Sem **Regulation:** R13

UNIT – 2

BEAMS & SHEAR, TORSION AND BOND

1. Design a continuous reinforced concrete beam of rectangular section to support a dead load of 10 kN/m and live load of 12 kN/m over 3 spans of 6 m each. The ends are simply supported. Adopt M 20 grade concrete and Fe – 415 HYSD bars. Sketch the details of reinforcements in the beam.
2. The critical section of an RC rectangular beam is subjected to a bending moment of 28kN-m, a torsional moment of 15kN-m and a shear force of 32kN. The overall size of the section is 350mmx700mm. Provide effective cover to reinforcement as 50mm. Concrete grade M25 and steel grade Fe-415 are used. Design the necessary for the section. Draw the drawings showing the design details.
3. A simply supported beam 300 mm x 600 mm (effective) is reinforced with 5 bars of 25 mm diameter. It carries a udl of 80 kN/m (including its own weight) over an effective span of 6 m. out of 5 main bars, two bars can be bent up safely near the supports. Design the shear reinforcement for the beam. Use M20 grade of concrete and Fe 415 steel.
4. A simply supported beam is 250 mm x 500 mm and has 2 – 20 mm TOR bars going into the support. If the shear force at the centre of support is 110 kN at working load, determine the anchorage length. Assume M20 mix and Fe 415 grade TOR steel.
5. (a) Describe the significance of serviceability limit state in the design of RC beams.
   (b) Determine the short term deflection of a simply supported rectangular beam of effective span 4.5 m. The cross-section of the beam is 300mm ×450 mm and is reinforced with 4-16 mm diameter bars in tension. The beam is subjected to imposed service load of 25kN/m. Adopt M 20 grade concrete and Fe 415 steel.
6. The rectangular reinforced concrete beam is simply supported on two masonry walls 230 mm thick and 6 m apart (centre to centre). The beam is carrying an imposed load of 15 kN/m. design the beam with all necessary checks. Use M25 concrete and Fe415 steel.

7. Design a rectangular beam 230 mm x 600 mm over an effective span of 5 m. The superimposed load on the beam in 50 kN/m. Effective cover to reinforcement is taken as 50 mm. Use M20 concrete and Fe415 steel.
8. Design a cantilever beam with a clear span of 2.5 m which carries a superimposed load of 20 kN/m. Use M20 mix and Fe415 steel.
9. A T-beam and floor system consists of 125 mm thick reinforced concrete slab monolithic with 300 mm wide beams. The beams are spaced at 3.6 m center-to-center and supported by 300 mm wide columns. The clear span of the beam is 6 m. Design an intermediate beam, if the slab is subjected to live load of 2.5 kN/m^2 and dead load of 1.5 kN/m^2. Use M 25 concrete and Fe 415 steel.
10. Design a single reinforced beam to carry a live load of 14 kN/m. The clear span of the beam is 5.5 m. The bearing at each end is 300 mm. Use M20 concrete and Fe415 steel.

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QUESTION BANK (OBJECTIVE)

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1. In a rectangular beam maximum shear stress occurs at [ ]
a) At top of the beam b) at bottom of the beam c) at the N.A d) none
2. Diagonal compression failure occurs when [ ]
a) $\tau_v > \tau_c$ b) $\tau_v > \tau_{cmax}$ c) $\tau_v < \tau_c$ d) $\tau_v < \tau_{cmax}$
3. Diagonal tension failure occurs [ ]
a) If shear force is dominant compared to B.M at support b) If B.M is dominant compared to S.F
c) Both (a) and (b) d) neither (a) and (b)
4. Flexural shear cracks occur when [ ]
a) Moment is dominant to S.F b) S.F is dominant to B.M
c) Both (a) and (b) d) neither (a) and (b)
5. Failure of R.C.C beam due to shear can only occurs on account of [ ]
a) Diagonal compression b) diagonal tension c) Web compression d) none
6. If the nominal shear stress τ_v at a section does not exceed the permissible shear stress τ_c [ ]
a) Minimum shear R.F is still provided b) shear R.F is provided to resist the nominal shear stress
c) No shear R.F is provided d) Shear R.F is provided for the difference of the two
7. The permissible shear stress in concrete for beams without shear R.F depends upon [ ]
a) Percentage of tension R.F b) Grade of concrete c) Both (a) & (b) d) none
8. An R.C.C beam of 200mmx300mm (effective) is subjected to a factored S.F 30KN. The maximum nominal shear stress in N/mm^2 [ ]
a) 0.5 b) 0.55 c) 0.75 d) none
9. A rectangular beam of size 200mmx300mm (effective) is subjected to an ultimate S.F of 50KN. The permissible shear stress is 0.2 N/mm^2. The S.F in KN is [ ]
a) 12 b) 38 c) 50 d) none
10. A T-beam of flange width 1000mm rib width 230mm and depth of 450mm is subjected to a shear of 46KN. The nominal shear stress in the beam in N/mm^2 is [ ]
a) 0.5 b) 0.115 c) 0.444 d) none
11. Shear span is defined as the zone where [ ]
a) B.M is zero b) S.F is zero c) S.F is constant d) B.M is constant
12. Distribution of shear stress over a rectangular RC section of a beam follows [ ]
a) Circular curve b) Straight line c) parabolic curve till NA d) an elliptical curve
13. How shear strength be ensured in a beam [ ]
a) By providing binding wire on remaining bars b) By providing HYSD bars instead of mild steel bars
c) By providing rounded aggregate d) By providing stirrups
14. When R.F concrete structures loaded, the resistance first broken is [ ]
a) Pure adhesive resistance b) mechanical resistance c) frictional resistance d) none

15. IS code checks the safety of a beam against bond primarily by considering [ ]
a) Flexural bond b) Anchorage bond c) Both (a) &(b) d) none
16. For a bar of diameter'd' the anchorage value of hook is [ ]
a) 2d b) 4d c) 8d d) 16d
17. The bond strength between steel R.F and concrete is affected by [ ]
a) Type of R.F b) Grade of concrete c) Shrinkage of concrete d) all of the above
18. The main reason for providing certain minimum number of reinforcing bars at a support in a simply supported beam is to resist in that zone [ ]
a) Compressive stress b) shear stress c) Bond stress d) Tensile stress
19. For M15 grade concrete and Fe415 steel the development length in tension is------ times the bar diameter [ ]
a) 68.5 b) 58 c) 55 d) 154
20. The lap length for bars in bending tension shall not be less than [ ]
a) Ld or 30φ b) 2Ld or 30 φ c) LD or 24 φ d) 2Ld or 24 φ
21. The lap length in compression is not less than [ ]
a) Ld or 30φ b) 2Ld or 30 φ c) LD or 24 φ d) 2Ld or 24 φ
22. For full anchorage, the stirrups should extend by a length of-------- times diameter of bar when bent at 135^o [ ]
a) 4 φ b) 8 φ c) 12 φ d) 6 φ
23. The length of bar beyond theoretical cut off point shall be [ ]
a) Anchorage length b) development length c) bond length d) dowel length
24. The crack pattern at failure due to torsion is [ ]
a) Vertical b) Diagonal at ends c) spiral d) circular
25. Compatibility torsion occurs in [ ]
a) Edge beams b) Grid system c) Canopy beams d) Both (a) & (b)
26. The transverse torsional R.F in R.C.C beams shall be provided as [ ]
a) Vertical stirrups b) Inclined stirrups c) Bentup bars d) all of theabove
27. The minimum number of torsional longitudinal R.F in R.C.C beam is [ ]
a) 2 b) 4 c) 3 d) any of the above
28. A rectangular beam is subjected to torsion. Side face R.F cement shall be provided if overall depth exceeds -------- mm [ ]
a) 450 b) 750 c) 500 d) more than the depth of flange
29. Longitudinal compression steel shall be designed for a beam subjected to torsion if [ ]
a) $M_t=M_u$ b) $M_t<M_u$ c) $M_t>M_u$ d) $M_t=0$
30. Force on a 500mm deep beam of 300mm wide, subjected to a S.F of 150 KN and torsion 30 KN-m, equivalent shear is [ ]
a) 180KN b) 310KN c) 246KN d) 210KN
31. If N.A lies in the flange, a T-beam can be treated as a rectangular beam of [ ]
a) $b_w d$ b) $d_f d$ c) $b_f d$ d) none
32. If N.A falls in the web and flange thickness larger than 0.2d , and the section is balanced, the stress in the flange will be [ ]
a) 0.446fck uniform b) 0.446fck partly and more than 0.446fck partly
c) 0.36fck partly and less than 0.36fck partly d) 0.446fck partly and less than 0.446fck partly
33. In T-beam the web and flange are more effective in resisting [ ]

a) Bending stress and shear stress respectively b) shear stress and bending stress respectively c) Both bending and shear d) none

34. The effective flange width of T-beams spaced at 3.25m with web depth of 1m, web width of 0.4m spanning 12m with a flange slab of 100mm thickness is [ ]

a) 3m b) 3.25m c) 2.5m d) 2.0m

35. A T-beam behaves as a rectangular beam of width equal to its flange if its N.A [ ]

a) Coincides with centroid of R.F b) coincides with centroid of T-section

c) Remains within the flange d) remains within the web

36. Poisson ratio of concrete [ ]

a)0.1to 0.2 b)0.2to0.5 c)0.3to0.5 d)05to0.4

37. Shrinkage strain of concrete as per IS 456-2000 [ ]

a)0.0003 b)0.002 c)0.2 d)0.5

38. Workability mainly depends on [ ]

a) w/c ratio b) admixtures c) aggregates d) all

39. unit weight of concrete as per IS 456-2000 [ ]

a) 26 kn/mm^2 b) 24 kn/mm^2 c) 28 kn/mm^2 d) 29 kn/mm^2

40. Grade of concrete increases strength of concrete [ ]

a)Increases b) decreases c) constant d) all

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