Question Bank

Subject- DCS-I (BCIE1-409) - MRSPTU

For 2 marks

1. What is ferro Concrete?
2. Why shrinkage in concrete occurs?
3. Define Modulus of Rupture and how is it calculated for concrete?
4. How is the Modulus of Elasticity of concrete measured?
5. Draw the flow chart for various concreting operations.
6. Explain creep of concrete.
7. Why bleeding of concrete occurs?
8. Distinguish between plain and prestressed concrete.
9. List the various types of cements.
10. What do you understand by flaky aggregate?
11. What is water cement ratio?
12. Explain the term segregation and bleeding with causes?
13. What are the various mix proportioning methods of concrete mix design?
14. Define concrete mix design. Difference between nominal and mix design.
15. Define Specific Gravity and how it is evaluated for fine and coarse aggregates?
16. As per IS: 456-2000, in how many grades concrete is designated. What do you mean by M20 concrete?
17. Distinguish between term 'factor of safety' and 'partial safety factor'.
18. If standard deviation is 5 $N/mm^{2,}$ what should be the mean strength of concrete, if desired characteristic strength is 35 N/mm^2.
19. Define following terms with sketches-
    Overall depth
    Effective depth
    Clear cover
    Effective cover
    Neutral axis
    Depth of neutral axis (x_u)
    Lever arm
20. Enumerate at least three situations in which doubly reinforced beams becomes necessary.
21. Define the terms of balanced, under and over reinforced with sketches.
22. Which section you would prefer out of under-reinforced sections and over-reinforced section? Give the reasons in support of your answer.

23 Define column.
24 Difference between short and long column.
25 What is slenderness ratio of column?
26 Write the formula for Euler's buckling load on column?
27 What is the minimum number of bars for rectangular and circular sections?
28 What is pitch of lateral ties in an axially loaded column?
29 Explain the various classification of column.
30 Design a rectangular an axially loaded column of size 250mm X 400mm. Load on the column is 800 KN. Safe bearing capacity of the soil is 180 KN/m^2. Use M25 concrete and Fe415 steel.

For 10 marks

31 What are the quality control tests carried on concrete ingredients?
32 What are the Various Design Philosophies followed for Reinforced Concrete?
33 Discuss in detail the steps involved in the mix design of concrete based on BIS method.

For 10 marks

1 Concrete Mix Design Example – M30 Grade Concrete

Grade designation – M30
Type of Cement: OPC 53 Grade confirming to IS 12269
Maximum Nominal size of aggregate - 20 mm
Shape of CA - Angular
Workability required at site - 25-50 mm (slump)
Type of exposure - (as defined in IS: 456) -Moderate
Specific Gravity of Cement : 3.15
Specific gravity of Fine Aggregate (sand) : 2.70
Specific gravity of Coarse Aggregate : 2.80
Fine aggregates : Zone I

2. Concrete Mix Design Example – M40 Grade Concrete

Design a concrete mix for use in reinforced concrete work from following data:
Grade Designation = M40
Type of cement= 43 grade OPC
Slump required= 100 mm
Exposure= severe
20mm maximum size crushed angular aggregate available
Fine aggregates corresponding to grading Zone-I
Specific gravity of coarse aggregates= 2.40

Specific gravity of fine aggregates= 2.40
Max w/c=0.45
Minimum cement content=320kg/m^3
Maximum cement content=450 kg/m^3
Chemical admixture type= Superplastisizer conforming to IS 9103.
Specific gravity of admixture = 1.145
Method of concrete placing: pumping concrete

3. Concrete Mix Design Example – M50 Grade Concrete

Grade Designation = M-50
Type of cement = O.P.C-43 grade
Slump required= 25-50 mm
20mm maximum size crushed angular aggregate available
Brand of cement = Vikram (Grasim)
Admixture = Plasticizer - Sika [Sikament 170 (H)]
Fine Aggregate = Zone-II
Sp. Gravity
Cement = 3.15
Fine Aggregate = 2.61
Coarse Aggregate = 2.65
Minimum Cement (As per contract) =400 kg / m^3
Maximum water cement ratio (As per contract) = 0.45
Specific gravity of admixture = 1.145
Method of concrete placing: pumping concrete

Q. 4. A column of 3.6m height is subjected to the following loads: (2/5marks)
Total DL= 30 kN
Total LL= 80kN
Wind load = 4 kN/m height
Determine the design loads for the limit state of
a. Collapse
b. Serviceability

(**Shear strength of Section) 5 marks**

1. A 250mm wide and 600mm deep R.C beam is reinforced with 2 legged 10mm inclined stirrups at 250mm c/c with α=60°. Longitudinal steel consist of 4 bars of 20mm with a cover of 40mm. If concrete grade is M25 and grade of steel is Fe415, determine the **shear strength** of the section.
2. A beam has an effective depth of 40 cm. At a particular section, it has 8 mm diameter 2 legged stirrups provided at 20 cm centre to centre. Calculate the **shear resistance** of the stirrups. Use M20 concrete and Fe 415 steel.

(Singly Reinforced Beam) 5 marks

1. Find the moment of resistance of R.C. beam of rectangular section 250 mm wide and 450 mm deep, if it is reinforced with 4 no's of 16mm bars. Assume grade of steel Fe250 and grade of concrete M20. Effective cover provided is 40 mm.

2. A R.C. beam of rectangular section 300mm wide and 500mm deep, if it is reinforced with 4 no of 16mm bars. Assume grade of steel Fe250 and grade of concrete M20. Effective cover provided is 50 mm. The beam is simply supported over a span of 5m. Find the maximum permissible UDL on the beam.
3. A singly reinforced rectangular beam is 400 mm wide. The effective depth of the beam section is 520 mm. A steel reinforcement consisting of 4 no HYSD steel 18mm diameter has been used in the beam section. The grade of concrete is M20 and grade of steel Fe500. Locate the neutral axis of the beam section. Determine the flexural strength of the beam.

(Flanged Section i.e T-beam) 5 marks

4. Determine the moment of resistance of a T beam with flange width 1000mm, web thickness 300mm, slab thickness 100 mm, effective depth 350 mm, and area of tension steel 2945 mm^2. Assume M20 concrete and Fe 415 steel.
5. Determine the approximate position of NA at ultimate load of a T-beam. Bf=750mm. Bw:=250mm,Df=120mm',d =450mmAst=3500 mm^2. fck= 15 fy= 415.

(Doubly Reinforced Beam) 5 marks

1. A doubly reinforced beam 250mm x 450mm is reinforced with 4#25mm on tension side and 4 # 18mm on compo Assume an effective cover provided is 50mm on both sides. Use f_{ck} = 20 and f_y = 415. Calculate ultimate moment carrying capacity of the section.
2. Find the moment of resistance of R.C. beam of rectangular section 300mm wide and 550mm deep, if it is reinforced with 6 no of 20mm bars on tension side and 2 no's of 20 mm bars on compression side. Assume grade of steel Fe250 and grade of concrete M20. Effective cover provided is 40 mm on both sides. Determine the moment of resistance of given section
3. A reinforced concrete beam of breadth of 250 mm and effective depth 500 mm is reinforced with 4 nos. 20 mm bars in the tension zone and 3 nos. 16 mm bars in compression zone. The effective cover to reinforcement is 30 mm.

Determine the moment of resistance of the section if M20 concrete and Fe415 grade steel are used

4. Find moment of resistance of R.C. beam of rectangular section 250 mm wide and 500 mm deep, if it is reinforced with 6 numbers of 20 mm bars on tension side and 2 numbers of 20 mm bars on compression side. Assume grade of steel Fe415 and grade of concrete M25. Effective cover provided is 40 mm on both sides? Determine the moment of resistance of given section?
5. A doubly reinforced rectangular beam is 300mm wide. The effective depth of beam is 550mm & cover is 50mm. The tension & compression reinforcement consists of 4No's 20mm diameter &4 No's 16mm diameter respectively. Locate neutral axis and moment of resistance of doubly reinforced beam. M20 grade of concrete & mild steel (Fe250) reinforcement is used.
6. Calculate the moment of resistance and uniformly distributed load which a Simply Supported beam of effective span 5 meters can carry if the cross section details are 250 × 550 effective depth and 600 mm overall depth. It is reinforced with 3 bars of 20 mm diameter in the compression zone and 4 bars of 25 mm diameter in the tension zone. Use the effective cover to compression reinforcement as 50 mm. Use M20 concrete and Fe 415 steel.

10marks

1. Design a rectangular beam is to be simply supported on supports of 230mm width. The clear span of beam is 6m. The beam is to have width of 300mm. The characteristic superimposed load is 12 kN/m. Using M25 concrete and Fe415 steel design the beam.
2. A T- beam slab floor has 125 mm thick slab forming part of T-beam which are of 8 m clear span. The end bearing is 450 mm thick. Spacing of T-beams is 3.5 m. the live load on the floor is 3 $kN/m^{2.}$ Design one of the immediate beams. Use M20 concrete and Fe250 steel.
3. A hall has clear dimension 3 m X 9 m with wall thickness 230 mm. The live load on the slab is 3.5 kN/m^2 and a finishing load of 1.5 kN/m^2 may be assumed. Using M20 concrete and Fe250 steel. Design the slab.