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Semester 5th

Branch : Civil Engg./Brick Tech ./ Constr Mgmt/ Spl. Highway Engg.

Subject:- Reinforced Cement Concrete

Time : 6Hrs. Design & Drawing M.M. : 150

SECTION-A

Note: Multiple choice questions. All questions are compulsory (10x1=10)

- Q.1 Bond stress should not be less than 1 N/mm^2 (CO3)
a) True b) False

Q.2 The Limiting value of moment of resistance for Fe 250 is (CO4)
a) $0.148 f_{ck} b/d^2$ b) $0.148/f_{ck} bd^2$
c) $0.148 f_{ck} bd$ d) $0.148 f_{ck} bd^2$

Q.3 Maximum strain in tension reinforcement, at failure shall not be less than (CO4)
a) $(0.85 f_y/E_s) + 0.002$ b) $(0.85 E_s/f_y) + 0.002$
c) $(0.87 f_y/E_s) + 0.002$ d) $(0.87 E_s/f_y) + 0.002$

Q.4 The maximum value of span / depth ration for cantilever beam is not allowed to exceed (CO5)
a) 5 b) 10
c) 15 d) 20

Q.5 The spacing of vertical stirrups in a rectangular beam is (CO5)
a) Maximum near the support
b) Minimum near the support

- Q.6 c) Maximum near the centre
d) Minimum near the centre

Q.6 The diameter of a reinforcement bar is f . The anchorage value of the U-type (CO6)

a) f b) $4f$
c) $10f$ d) $16f$

Q.7 The ratio of rib to depth of rib, for T-beam is generally kept as (CO7)

a) 1/2 to 2/3 b) 1/3 to 2/3
c) 1/2 to 3/4 d) 1/2 to 1/4

Q.8 A T-beam becomes identical to a rectangular beam with width equal to flange in case (CO7)

a) Neutral axis remains below the slab
b) Neutral axis remains within flange
c) Neutral axis coincides with the geometrical centre of beam
d) None of these

Q.9 In a two way slab with corners held down, the torsion steel is provided at (CO8)

a) Top b) Bottom
c) Middle d) Both (a) and (b)

Q.10 The minimum percentage of reinforcement in RCC column is (CO10)

a) 0.3% b) 0.5%
c) 0.6% d) 0.8%

SECTION-B

Note: Objective type questions. All questions are compulsory. (10x1=10)

- Q.11 Not more than..... percent of bars may be spliced at one section (CO3)
- Q.12 Diagonal cracks are also known as (CO3)
- Q.13 Beams are also known as members (CO4)
- Q.14 The limiting value of depth of N.A. for Fe-415 steel is (CO4)
- Q.15 Bearing of beams spanning more than 5.5m, should not be less than (CO5)
- Q.16 When the beam is subjected to eccentric loading the singly reinforced beams are provided (True/ False) (CO6)
- Q.17 beams are designed when the dimensions of the beam are restricted (CO6)
- Q.18 If $X_u > D_f$ then neutral axis lies in of T-beam (CO7)
- Q.19 Single wires used as steel reinforcement are called as (CO11)
- Q.20 When corners of the two-way slab are not held down it is known as (CO9)

SECTION-C

Note: Short answer type questions. Attempt any twelve questions out of fifteen questions. (12x5=60)

- Q.21 What are requirements of a good concrete. (CO1)

Q.22 Write any five salient features of limit state method. (CO2)

- Q.23 An RCC beam 350mm X 600 mm effective has a shear force of 350 kN. If the tensile stress is 1.5% find the nominal shear stress in the beam and comment upon shear design. Use M20 grade of concrete (CO3)

- Q.24 A singly reinforced rectangular beam of width 230 mm and 450 mm effective depth is reinforced with 4 bars of 20 mm diameter. Find out the depth of neutral axis and specify the type of beam. Use M25 concrete and Fe-415 steel. Also find the lever arm for the section (CO4)

- Q.25 Find the area of reinforcement required for a singly reinforced beam of size 250mm x 500 mm to resist a factored moment of 65 kn-m. Use M15 concrete and Fe-250 Steel. (CO4)

- Q.26 Calculate the factored bending moment for a simply supported rectangular beam having clear span 4.5 m and superimposed load 6kN/m. Use M20 concrete and Fe415 steel. (CO5)

- Q.27 Under which conditions, the doubly reinforced beams are provided (CO6)

- Q.28 Write a short note on T-beams (CO7)

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- Q.29 Calculate the ultimate maximum bending moment for a two-way simply supported slab of a room 4.5m x 6.5 m. The edges of the slab are not held down. The live load on the slab is 2.5 kN/m^2 . The Slab has a bearing of 150mm on the supporting walls. Use M20 concrete and Fe-415 steel. Also apply the check for depth of slab (CO9)
- Q.30 Calculate the area of steel reinforcement along the short and long span for the two-way slab with the data given in Question No. 29 (CO9)
- Q.31 Write down the IS specifications and restrained slabs (CO9)
- Q.32 Why main reinforcement is provided along the shorter span in one way slab? (CO8)
- Q.33 A short column 450mm x 450mm is reinforced with 4 bars of 25mm diameter find the ultimate load carrying capacity of the column if the minimum eccentricity is less than 0.05 times the lateral dimensions. Use Fe-415 steel and M20 Concrete. (CO10)
- Q.34 Write down the assumptions for the limit state of collapse in compression. (CO10)
- Q.35 Write any five advantages of pre-stressed concrete. (CO11)

Section-D

Note : Long answer type questions. Attempt any Two questions out of Three questions.($2 \times 10 = 20$)

- Q.36 Write down the steps for the design of singly reinforced beam using the limit (CO5)

- Q.37 A doubly reinforced beam is 200 mm wide and 350mm deep to the centre of the tensile reinforcement. The areas of the compression and tensile steel are 1245 mm^2 and 1600 mm^2 respectively . The effective cover to the compression reinforcement is 50mm. Find the ultimate moment of resistance of the beam section. Use m15 concrete and Fe250 steel (CO6)
- Q.38 Design a simply supported one-way slab supported on masonry walls to the following requirements : Clear span = 3.25 m, Live load = 2 KN/m^2 Use M20 concrete and Fe-415 steel. Assume any other missing data (CO8)

Section-E

Note: Very Long answer type questions. Attempt any two questions out of three questions. $2 \times 25 = 50$

- Q.39 Draw the X-section along the longer span and plan of reinforcement of a two-way RCC slab form the following data: (CO12)

Size of room = $4.5\text{ m} \times 6.25\text{ m}$

Thickness of slab = 180 mm

Bearing on walls = 180mm

Reinforcement parallel to shorter span (with alternate bars bent-up at 750mm from edge of slab):

- a) Middle strip = 10 mm dia @ 160mm c/c
- b) Edge strip = 10 mm dia @ 280mm c/c

Reinforcement parallel to longer span (with alternate bars bent-up at 960mm from edge of slab):

- a) Middle strip = 10 mm dia @ 170mm c/c
- b) Edge strip = 10 mm dia @ 350mm c/c

Torsional reinforcement (both top and bottom :1070 from edge of slab):

- a) 10mm dia bars @ 160 mm c/c parallel to longer span
- b) 10mm dia bars @ 190 mm c/c parallel to longer span

Q.40 Draw the sectional plan and elevation for a rectangular column with isolated footing of uniform thickness with the following data : (CO14)

Size of column = 250mm x 500mm

Depth below GL = 1150 mm

Plinth level above GL = 400mm

Height of ceiling above plinth level = 3.3m

Size of footing = 2.5m x 1.5mm

Thickness of footing = 500mm

Column reinforcement

Longitudinal bars = 6 bars of 20 mm dia

Lateral ties = 8 mm dia @ 250mm c/c

Footing reinforcement :

Along longer side = 10 mm dia @ 190mm c/c

Along shorter side = 12 mm dia @ 180 mm c/c

Q.41 Draw the longitudinal section and two cross-sections (one at mid span and other near the support) of a doubly reinforced RCC beam with the following data : (CO13)

Size of beam = 250 mm x 500mm

Clear span = 4.5m

Bearing on walls = 300 mm

Main tensile reinforcement = 4 bars of 20 mm dia (out of which two bars are bent-up at L/7

Compression reinforcement = 2 bars of 16 mm dia

Shear stirrups = 8 mm dia 2 legged @ 180 mm c/c