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5th Sem / Civil

Subject : Reinforced Cement Concrete Design and Drawing

Time : 6 Hrs. M.M. : 120

SECTION-A

Note: Multiple choice questions. All questions are compulsory (6x1=6)

Q.1 Total amount of losses in pre-tensioning method are approximately _____

a) 10% to 17% b) 21% to 25%
c) 18% to 20% d) 26% to 30%

Q.2 Define yield point is obtained in the_____ grade of steel.

a) Fe - 250 b) Fe - 500
c) Fe - 415 d) Fe - 550

Q.3 For over reinforced section_____

a) $X_u = X_{u(max)}$ b) $X_u > X_{u(max)}$
c) $X_u < X_{u(max)}$ d) None of these

Q.4 In flexural members, the failure of concrete takes place due to _____

a) Tensile stresses b) Diagonal tension
c) Diagonal compression d) All of these

Q.5 When the slenderness ratio of column exceeds 12, then it is termed as_____

a) Short column b) Long column
c) Medium column d) None of these

Q.6 The maximum value of span / depth ratio (1/d) permissible in case of cantilever RCC beam is _____

a) 5 b) 10
c) 7 d) 15

SECTION-B

Note: Objective/ Completion type questions. All questions are compulsory. (6x1=6)

Q.7 When increase in (1_x / I_y) ratio, the value of bending moment of factor (α_x) _____ (Decreases / Increases)

Q.8 In doubly reinforced beams the main steel is provided in compression zone. (True/False)

Q.9 In singly reinforced beams, main steel is provided in_____ zone. (Compression / tension)

Q.10 _____ is the value of minimum diameter of bar recommended for columns. (10 mm / 12 mm)

Q.11 Bent-up bars are provided at an angle of_____ with horizontal (45º / 60º)

Q.12 Minimum grade of concrete to be used for R.C.C works, as per IS Code: 456 - 2000 is _____ (M 20 / M 25)

SECTION-C

Note: Short answer type questions. Attempt any eight questions out of ten questions. (8x4=32)

Q.13 Write any five comparisons between One-way slab and two-way slab.

Q.14 Calculate the area of tensile steel for simply supported and singly reinforced rectangular beam having clear span 4.50m and superimposed load 6.10 kN/m. Use M -20 Grade of concrete and Fe - 415 Grade of steel.

Q.15 Determine the depth of neutral axis for a rectangular beam section reinforced with 1% steel at an effective depth of 500 mm. The width of the section is 230 mm. Use M -20 Grade of concrete and Fe - 415 Grade of steel.

Q.16 Calculate the development length, if a simply supported R.C.C beam 300 mm X 500 mm (effective), has a clear span of 4.5 m. The factored shear force at the centre of 300 mm wide support is 125 kN. The beam is reinforced with 4 bars of 20 mm diameter (out of 4 bars, 2 bars are bent up). Assume cover to reinforcement on all sides as 30 mm. Use M-20 Grade of concrete and Fe-415 Grade of steel.

Q.17 Write a short note on partial safety factor for strength of materials.

Q.18 Calculate the ultimate maximum bending moment using IS Code Method, in a slab for a lacture theatre of clear dimension 4m X 5m. The slab is simply supported on all four edges. The width of wall is 300 mm. the slab has to carry a live load of 3150 N/m^2. And floor finish of 1100 N/m^2. Use M -20 Grade of concrete and Fe - 415 Grade of steel.

Q.19 Write the assumptions made in limit state of collapse (flexure)

Q.20 Describe the design stress-strain curve for high yield strength deformed steel.

Q.21 An R.C.C beam has an effective depth of 700 mm and width of 300 mm. It contains 6 bars of 25 mm diameter. Use M - 25 Grade of concrete and Fe - 415 Grade of steel. Check whether shear reinforcement is required for a factored shear force of 250 kN.

Q.22 Write the various differences between pre-tensioning and post-tensioning methods of pre-stressing.

SECTION-D

Note: Long answer type questions. Attempt any two questions out of three questions. (2x8=16)

Q.23 A doubly reinforced beam section is 300 mm X 500 mm overall. It is provided with 2-12 mm diameter as compression steel and 4-25 mm diameter as tensile steel. The reinforcement are provided at an effective cover of 40 mm. Determine the ultimate moment of resistance of the beam section. Use M - 20 Grade of concrete and Fe - 415 Grade of steel.

Q.24 Design a simply supported RCC one way slab to carry a factored load of 15.25 kN/m^2 (including self weight) on an effective span of 3.10m. Bearing on wall = 300mm. use M20 concrete and Fe- 415 steel. (Assume any other missing data)

Q.25 Design a short rectangular column subjected to an ultimate load of 2100 kN. Use M - 20 Grade of concrete and Fe - 415 Grade of steel. Assume $e_{min.} < 0.05D$.

SECTION-E

Note: Attempt any three questions out of four questions. (3x20=60)

Q.26 Draw the sectional plan and sectional elevation (assume suitable scale) for a rectangular column with isolated footing of uniform thickness with the following data:

a) Size of column = 300 mm X 500 mm
b) Size of footing = 1500 mm X 2000 mm
c) Thickness of footing = 500 mm
d) Depth below ground level = 1000 mm
e) Plinth level above ground level = 300 mm
f) Height of ceiling above plinth level = 3000 mm

Footing reinforcement :

a) Reinforcement parallel to longer side= 12 mm Æ250 mm c/c
b) Reinforcement parallel to shorter side = 16 mmÆ200 mm c/c

Column reinforcement :

a) Main longitudinal bars in column = 6 -20 mm Æ
b) Lateral ties in column = 8 mm Æ@ 250 mm c/c

Q.27 Draw the X-section along the longer span and bottom plan of reinforcement of a two-way RCC slab from the following data:

a) Size of room = 5m X 6.5 m
b) Thickness of slab = 200 mm
c) Bearing on walls = 160 mm

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

a) Middle strip = 10 mm dia @ 160 mm c/c
b) Edge strip =10 mm dia @ 300 mm c/c

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

a) Middle strip = 10 mm dia @ 190 mm c/c
b) Edge strip = 10 mm dia @ 350 mm c/c

Torsional reinforcement (both top and bottom : 1060 from edge of slab):

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

Q.28 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:

a) Size of beam = 300 mm X 500 mm
b) Clear span = 4.7 m
c) Bearing on walls = 300 mm
d) Main tensile reinforcement = 4 bars of 20 mm dia (out of which two bars are bent-up at L/7)
e) Compression reinforcement = 2bars of 16 mm dia
f) Shear stirrups =8 mm dia 2 legged @ 190 mm c/c

Q.29 Draw a detailed cross-section of column to beam connection over two floors with the following data:

Column

a) 400 mm X 400 mm above ground level and 600 mm X 600 mm below ground level upto 300 mm depth
b) Footing = 2.0 m X 2.0 m
c) Thickness at column face = 400 mm
d) Thickness at ends = 250 mm
e) Base concrete 1:6:12 = 2.3 m X 2.3 m X 0.3 m
f) Total depth of foundation = 1.0 m

Reinforcement

a) Main bar = 8 Nos. - 20 mmF bars
b) Ties = 2 Legged 6 mm F @ 300 c/c
c) Pedestal bars = 4 Nos. - 16 mm F bars
d) Footing reinforcement = 12 mm F bars @ 100 mm c/c

Beam = 400 MM x 400 mm

a) Main reinforcement = 4 Nos. 20 mm F bars with two bar bent up
b) Anchor bars = 2 Nos. 14 mm F bars
c) Stirrups = 2 Legged 6 mm F bars @ 150 c/c upto 1/7 and @ 300 c/c in the remaining part. (Where, I = Effective span)