5th Sem./ Civil
Subject : RCC Design & Drawing

Time : 6 Hrs.   M.M. : 120

SECTION-A

Note: **Multiple Choice Questions. All Questions are compulsory.**
                                                    (6x1=6)

Q.1   When the slenderness ratio of column is less than 12, then it is termed as _____.
       a)   Short column   b)   Long column
       c)   Medium column   d)   None of these

Q.2   The maximum value of span / depth ratio (I/D) permissible in case of simply supported RCC beam is _____.
       a)   5   b)   15
       c)   10   d)   20

Q.3   For making a standard U-Shaped hook, the anchorage value prescribed is _____.
       a)   4F   b)   12F
       c)   8F   d)   16F

Q.4   Pre-stressed concrete helps in avoiding_____.
       a)   Diagonal tension   b)   Excessive deflection
       c)   Crack formation   d)   All of these

Q.5   The beam is doubly reinforced, when _____.
       a)   Mu = Mu(lim)   b)   Mu > Mu(lim)
       c)   Mu < Mu(lim)   d)   None of these

Q.6   Unit weight of R.C.C. in kN/m^3 is _____.
       a)   23   b)   25
       c)   24   d)   26

Section-B

Note: **Objective type questions (Select the appropriate option). All questions are compulsory.**   **(6x1=6)**

Q.7   _____is the minimum number of longitudinal bars required for circular column. (4 Nos./6 Nos.)

Q.8   Hooks of stirrups must be provided in _____zone. (Tensile/Compressive)

Q.9   _____beams are provided when the dimension of beam are restricted. (Singly reinforced / Doubly reinforced)

Q.10   The limit state corresponding to maximum load carrying capacity is known as limit state of _____ (Collapse / Serviceability)

Q.11   In singly reinforced beams _____ zone is below the neutral axis. (Compression / Tension)

Q.12   The minimum area of reinforcement in a slab is 0.12% of gross cross-sectionl area in case of HYSD steel. (True/False)

Section-C

Note: **Short answer type Question. Attempt any eight questions out of Ten Questions.**   **(8x4=32)**

Q.13   Write any four advantages and four disadvantages of pre-stressed concrete.

Q.14   An R.C.C. beam 250mm X 500 mm effective has a shear force of 300kN. If the tensile steel is 1% find the nominal shear stress in the beam and comment upon shear design. Use M-20 Grade of concrete and Fe-415 Grade of steel.

Q.15   Calculate the ultimate maximum bending moment in a slab simply supported over a room of size 5m X 7m as per IS Code Method. The edges of slab are not held down. Th live load on the slab is 3.10 kN/m^2. The slab has a bearing of 150mm on the supporting walls. Use MM-20 Grade of concrete and Fe-415 Grade of steel.

Q.16   Describe the relationship between yield stress and percentage elongation of a steel bar.

Q.17   Describe the design stress-strain curve for concrete.

Q.18   A singly reinforced rectangular beam of width 250mm and 450mm effective depth is reinforced with 4 bars of 20mm diameter. Find out the depth of neutral axis and specify the type of beam. Use M-25 Grade of concrete and Fe-250 Grade of steel.

Q.19   Determine the development length, if a simply supported R.C.C. beam 300 mm X 500 mm (effective), has a clear span of 5m. The factored shear force at the centre of 300 mm wide support in 120 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 30mm. Use M-20 Grade of concrete and Fe-415 Grade of steel.

Q.20   Write a short note on characteristic strength of concrete.

Q.21   Calculate the areas of tensile steel for a simply supported and singly reinforced rectangular beam having clear span 4.25 m and superimposed load 6.25 kN/m. Use M-20 Grade of concrete and Fe-415 Grade of steel.

Q.22 Write the various differences between One-Way slab and Two-Way slab.

SECTION-D

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

Q.23 Design a short circular column to carry the service load 1100 kN using helical reinforcement. Use M-20 Grade of concrete and Fe-415 Grade of steel. Assume $e_{min} < 0.05D$. (CO2)

Q.24 An RCC beam 400mm X 600mm effective is subjected to a working bending moment of 400 kNm. Find the area of steel required for beam. Use M-20 Grade on concrete, Fe-415 Grade of steel and d' = 50 mm.

Q25 Design a simple supported RCC one way slab to carry a factored load of 15.75 kN/M^2 (including self weight) on an effective span of 3.25m. Bearing on wall = 300mm. Use M20 concrete and Fe-415 steel. (Assume any other missing data)

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 circular column with isolated footing of uniform thickness with the following data:
a) Diameter of Column = 500 mm
b) Size of footing = 1200 mm X 1200mm
c) Thickness of footing = 400mm
d) Depth below ground level = 900 mm
e) Plinth level above ground level = 300mm
f) Height of ceiling above plinth level = 3300mm

Footing rein forcement:
a) Reinforcement both sides = 16mm φ 250 mm c/c

Column rein forcement:
a) Main longitudinal bars in colum = 8-20 mm φ
b) Lateral ties in column = 10mm φ @ 250 mm c/c

Q27. Draw a detailed cross-section of column to beam connection over two floors with the following data:
a) 400mm X 400mm above ground level and 600mm X 600mm below ground level upto 300 mm depth
b) Footing = 2.0m X 2.0m

c) Thickness at column face = 400mm
d) Thickness at ends = 250m
e) Base Concrete = 1:6"12 = 2.3m X 2.3m X 0.3m
f) Total depth of foundation = 1.0 m

Reinforcement
a) Main bar = 8 nos - 20 mm F bars
b) Anchor bars = 2nos 14 mm bars
c) Stirrups = 2 Legged 6mm F bar@ 150 c/c upto 1/7 and @ 300 c/c in the remaining part. (Where, 1 = Effective span)

Q.28 draw the X-section along the longer span and plan of reinforcement of a two-way RCC slab from the following data:
a) Size of room = 4.75 m X 6.25 m
b) Thickness of slab = 200 mm
c) Bearing of walls = 180 mm

Reinforcement parallel to shorter span (with alternate bars bent-up at 750 mm from edge of slab):
a) Middle strip-10mm dia @ 170 mm c/c
b) Edge stip = 10 mm dia @ 290 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 @ 360 mm c/c

Torsional reinforcement (both top and bottom: 1060m from edge of slab):
a) 10 mm dia bars @ 170 mm c/c parallel to shorter span
b) 10 mm dia bars @ 190 mm c/c parallel to longer span

Q.29 Draw the longitudinal section and two cross sections (one at mid span and other near the support) of a doubly reinforce RCC beam with the following data:
a) Size of beam = 300mm X 500 mm
b) Clear span = 5.0 m
c) Bearing on walls = 300 mm
d) Main tensile reinforcement = 5 bars of 20 mm dia in two tiers (3 bars in the lower tier and 2 bars in the upper tier)
e) The bars of the upper tier are bent up at L/7 centre of support
f) Spacer bars = 20 mm dia @ 1 m c/c
g) Compression reinforcement = 2 bars of 12 mm dia
h) Shear stirrups = 8 mm dia 2 legged @ 190 mm c/c