Q. If f_{cu} and f_y are cube compressive strength of concrete and yield stress of steel respectively and E_s is the modulus of elasticity of steel, for all grades of concrete, the ultimate flexural strain in concrete, can be taken as

(a)   0.002

(b) F_{cu} / 1000

(c)   0.0035

(d) $\dfrac{F_y}{1.15E_S} + 0.002$

Q. The maximum strain in concrete at the outermost compression fibre in the limit state design of flexural member is (as per IS: 456-1978)

(a) 0.0020

(b) 0.0035

(c) 0.0065

(d) 0.0050

Q. In limit state approach spacing of main reinforcement controls primarily

(a) Collapse

(b) Cracking

(c) Deflection

(d) Durability

Q. Unequal top and bottom reinforcement in a reinforced concrete section leads to

(a) Creep deflection

(b) Shrinkage deflection

(c) Long-term deflection

(d) Large deflection

Q. Flexural collapse in over-reinforced beams is due to

(a) Primary compression failure
(b) Secondary compression failure
(c) Primary tension failure
(d) Bond failure

Q. Combination of partial safely factors for loads under limit state of collapse and limit 'state of serviceability will be

(a)   1.5 (DJ + L.L) or 1.5 (D.L + W.L) or 1.2 (D.L + L.L + W.L) and D.L + 0.8(L.L +W.L)

(b)   1.5 (D.L + L.L) and D.L + 0.8(L.L + W.L

(c) 1.5(D.L + L.L) or 1.5 (D.L + W.L) or 1.2 (D.L + L.L + W.L) and 1.0(D.L + L.L) or 1.0 (D.L + W.L) or D.L + 0.8 (L.L + W.L)

(d)   1.2(D.L + L.L + W.L) and 1.0(D.L + L.L) or 1.0(D.L + W.L) or D.L + 0.8(L.L + W.L)

Q. If modular ratio is 'm', effective depth is D and stress ratio is r($r = \sigma_{st} / \sigma_{cbc}$) ,the depth of neutral axis of a balanced section is

(a) $\dfrac{m}{m-r} \cdot D$

(b) $\dfrac{m}{m+r} \cdot D$

(c) $\dfrac{m+r}{m} \cdot D$

(d) $\dfrac{m}{r} \cdot D$

Q. Match List I with List II and select the correct answer:

List-I	List-II
A. Serviceability	1. Sliding
B. Shear key	2. Deflection
C. Shrinkage	3. Cracking
D. Concrete spalling	

Codes:

a. A – 1, B – 3, C – 4, D – 2
b. A – 2, B – 1, C – 3, D – 4
c. A – 1, B – 3, C – 2, D – 4
d. A – 2, B – 1, C – 4, D – 3

Q. What should be the minimum grade of reinforced concrete in and around sea coast construction?

(a) M 35

(b) M 30

(c) M 25

(d) M 20

Q. What is the value of flexural strength of M 25 concrete?

(a) 4.0 MPa
(b) 3.5 MPa
(c) 3.0 MPa
(d) 1.75 MPa

Q. The final deflection due to all including effects of temperature, creep and shrinkage measured from as-cast level of the supports of floors, roofs and all other horizontal members of reinforced concrete should not normally exceed

(a)   Span / 350

(b)   Span / 250

(c)   (Span / 350) or 20 mm whichever is less

(d)   (5/348) of span

Q. Consider the following statements: Modulus of elasticity of concrete is

(a) tangent modulus

(b) secant modulus

(c) proportional to $\sqrt{f_{CK}}$

(d) proportional to $1 / \sqrt{f_{CK}}$

Which of the statements given above are correct?

(a) 1 and 3 only   c. 1 and 4 only

(b) 2 and 3 only   d. 2 and 4 only

Q. Match List-I with List-II and select the correct answer using the code given below the lists:

List-I	List-II
A. IS-875	1. Earthquake resistant design
B. IS-1343	2. Loads
C. IS-1893	3. Liquid storage structure
D. IS-3370	4. Prestressed concrete

Codes:

a. A – 3, B – 1, C – 4, D – 2
b. A – 2, B – 1, C – 4, D – 3
c. A – 3, B – 4, C – 1, D – 2
d. A – 2, B – 4, C – 1, D – 3

Q. What is the modular ratio to be used in the analysis of RC beams using working stress method if the grade of concrete is M 20?

(a) 18.6

(b) 13.3

(c) 9.9

(d) 6.5

Q. Match List-I with List-II and select the correct answer using the code given below the lists:

List I	List II
A. Moment & shear	1. Durability coefficients
B. Fire resistance	2. Stability
C. Sliding	3. Analysis of structure
D. Span to depth	4. Deflection limits ratio of beam

Codes:

a. A – 4, B – 2, C – 1, D – 3

b. A – 3, B – 2, C – 1, D – 4

c. A – 4, B – 1, C – 2, D – 3

d. A – 3, B – 1, C – 2, D – 4

Q. In limit state design of concrete for flexure, the area of stress block is taken as

(a) $0.530\ f_{ck}'\ X_U$

(b) $0.446\ f_{ck}'\ X_U$

(c) $0.420\ f_{ck}'\ X_U$

(d) $0.360\ f_{ck}'\ X_U$

Where F is characteristic compressive strength of concrete and is the depth of neutral axis from top.

Q. Consider the following statements:

Percentage of steel for balanced design of a singly reinforced rectangular section by limit state method depends on

a. Characteristic strength of concrete.
b. Yield strength of steel.
c. Modulus of elasticity of steel.
d. Geometry of the section.

Which of these statements are correct?

(a) 2, 3 and 4   c. 1, 3 and 4
(b) 1, 2 and 4   d.1, 2 and 3

Q. Match List-l with List-II and select the correct answer using the codes given below the lists:

List-I | List-II

A. Doubly reinforced section   1. Serviceability

B. Limit state design   2. Durability

C. Minimum cover   3. Reduction in sectional depth

D. Span depth ratio   4. Ultimate moment capacity

Codes:

a. A – 1, B – 2, C – 4, D – 3

b. A – 3, B – 2, C – 4, D – 1

c. A – 1, B – 4, C – 2, D – 3

d. A – 3, B – 4, C – 2, D – 1

Q. Grade of steel is designated as Fe 415, if

(a) The upper yield stress of the steel is 415 N/mm^2

(b) The ultimate stress of the steel is 415 N/mm^2

(c) The partial safety factor is 1.15

(d) The characteristic strength is 415 N/mm^2

Q. The additional cover thickness to be provided in reinforced concrete members that are totally immersed in seawater is

(a) 25 mm
(b) 30 mm
(c) 35 mm
(d) 40 mm

Q. If any tension reinforcement in an RC beam attains its yield stress during loading before the concrete in the compression zone fails due to crushing, the beam is said to be

(a) Under-reinforced
(b) Over-reinforced
(c) Balanced
(d) Non-homogeneous

Q. The distance between the centroid of the area of tension reinforcement and the maximum compressive fibre in a reinforced concrete beam design is known as

(a) Overall depth
(b) Effective depth
(c) Lever arm
(d) Depth of neutral axis

Q. The minimum strain at failure in tension steel having yield stress f_Y = 415 MPa and Young's Modulus E_S = 200 GPa, as per Limit State 80. Method of Design, is

(a) 0.0025

(b) 0.0038

(c) 0.0045

(d) 0.0050

Q. What is the pH value of potable water, as specified by IS 456 - 2000?

(a) Equal to 7

(b) Between 6 and 9

(c) Less than 6

(d) Not less than 6

Q. If the nominal shear stress (τ_y) at a section does not exceed the permissible shear stress (τ_c)

(a)   Minimum shear reinforcement is still provided

(b)   Shear reinforcement is provided to resist the nominal shear stress

(c)   No shear reinforcement is provided

(d)   Shear reinforcement is provided for the difference of the two

Q. In a reinforced concrete retaining wall, a shear key is provided, if the

(a) Shear stress in the vertical stem is excessive

(b) Shear force in the toe slab is more than that in the heel slab

(c) Retaining wall is not safe against sliding

(d) Retaining wall is not safe against overturning

Q. The maximum permissible shear stress τ_{cmax} given in BIS 456-1978 is based on

(a) Diagonal tension failure
(b) Diagonal compression failure
(c) Flexural tension failure
(d) Flexural compression failure

Q. Which one of the following statement is correct?

The critical section for computing design shear force in an R.C. beam where the supports exert a compressive reaction is at

(a) The centre of support

(b) The face of support

(c) A distance of half of effective depth from the face of support

(d) A distance of effective depth from the face of support

Q. Which one of the following statements is correct?

Minimum shear reinforcement is provided to

(a) Resist shear force at the support

(b) Resist shear on account of accidental torsion

(c) Arrest the longitudinal cracks on side faces due to shrinkage and temperature variation

(d) Resist shear in concrete developing on account of non-homogeneity of concrete

Q. Shear strength of concrete in a reinforced concrete beam is a function of which of the following:

1. Compressive strength of concrete
2. Percentage of shear reinforcement
3. Percentage of longitudinal reinforcement in tension in the section
4. Percentage total longitudinal reinforcement in the section

Select the correct answer using the code given below

(a) 1, 2 and 4   c. 1, 2 and 3
(b) Only 1 and 3   d. Only 1 and 4

Q. How can shear strength be ensured in a beam?

(a) By providing binding wire on main bars

(b) By providing HYSD bars instead of mild steel bars

(c) By providing rounded aggregate

(d) By providing stirrups

Q. What is the adoptable maximum spacing between vertical stirrups in an RCC beam of rectangular cross-section having an effective depth of 300 mm?

(a) 300 mm

(b) 275 mm

(c) 250 mm

(d) 225 mm

Q. In a reinforced concrete section the of the nominal shear stress diagram is

(a) parabolic over the full depth

(b) parabolic above the neutral axis and rectangular below the neutral axis

(c) rectangular over the full depth

(d) rectangular above the neutral axis and parabolic below the neutral axis

Q. Assuming the concrete below the neutral axis to be cracked, the shear stress across the depth of a singly reinforced rectangular beam section

(a) increases parabolically to the neutral axis and then drops abruptly to zero value

(b) increases parabolically to the neutral axis and then remains constant over the remaining depth

(c) increases linearly to the neutral axis and then remains constant up to the tension steel

(d) increases parabolically to the neutral axis and then remains constant up to the tension steel

Q. If the stirrup spacing is equal to 0.75 times the effective depth of an RC beam, then the shear capacity of stirrup steel is equal to

a. $1.25 \ (f_y \ A_{sv})$

b. $1.16 \ (f_y \ A_{sv})$

c. $1.00 \ (f_y \ A_{sv})$

d. $0.80 \ (f_y \ A_{sv})$

where fy is yield strength and A_{sv} is cross-sectional area of the stirrup steel.

Q. The distance between theoretical cut-off point and actual cut-out point in respect of the curtailment of reinforcement of reinforced concrete beams should not be less than

(a) Development length

(b) 12 x dia of bar or effective depth whichever is greater

(c) 24 x dia of bar or effective depth whichever is greater

(d) 30 x dia of bar or effective depth whichever is greater

Q. Which one of the following is the correct expression to estimate the development length of deformed reinforcing bar as per IS code in limit state design?

(a) $\dfrac{\Phi \sigma_s}{4.5 \tau_{bd}}$

(b) $\dfrac{\Phi \sigma_s}{5 \tau_{bd}}$

(c) $\dfrac{\Phi \sigma_s}{6.4 \tau_{bd}}$

(d) $\dfrac{\Phi \sigma_s}{8 \tau_{bd}}$

ϕ where is diameter of reinforcing bar, σ_S is the stress in the bar at a section and τ_{bd} is bond stress

Q. What is the anchorage value of a standard hook of a reinforcement bar of diameter O?

(a)   4 0

(b)   8 0

(c) 12 0

(d)   16 0

Q. Lap length of reinforcement in compression shall not be less than.

(a) 30 ϕ
(b) 24 ϕ
(c) 20 ϕ
(d) 5 ϕ

where ϕ is diameter of bar

Q. An R.C. structural member rectangular in cross section of width and depth D is subjected to a combined action of bending moment M and torsional moment T. The longitudinal reinforcement shall be designed for a moment Me given by

(a) $M_e = M + \dfrac{T(1+D/b)}{1.7}$

(b) $M_e = M + \dfrac{T(1-b/D)}{1.7}$

(c) $M_e = \dfrac{T(1-D/b)}{1.7}$

(d) $M_e = \dfrac{T(1-b/D)}{1.7}$

Q. Torsion reinforcement provided at the corners of a two-way slab

(a) distributes bending moment uniformly

(b) prevents corners from lifting

(c) controls cracking at corners

(d) does not allow any twist at corners

Q. The main reinforcement of a RC slab consists of 10 mm bars at 10 cm spacing. If it is desired to replace 10 mm bars by 12 mm bars, then the spacing of 12 mm bars should be

(a) 12 cm
(b) 14 cm
(c) 14.40 cm
(d) 16 cm

Q. Yield line theory results in

(a) Elastic solution
(b) Lower bound solution
(c) Upper bound solution
(d) Unique solution

Q. In case of 2-way slab, the limiting deflection of the slab is

(a) primarily a function of the long span

(b) primarily a function of the short span

(c) independent of long or short span

(d) dependent on both long and short spans

Q. Designs of one-way RC slabs for concentrated load is done by

(a) using Pigeaud's moment coefficients

(b) taking slab strip of unit width containing the load.

(c) taking slab strip of width effective in resisting the load

(d) taking orthogonal slab strips of unit width containing the load

Q. In Pigeaud's coefficient method for the analysis of an interior panel of a T-beam bridge

(a) notation for coefficients as aX_4 and ay 4 includes suffix 4 since the panel is continuous on all the four edges

(b) Poisson's ratio of concrete has no contribution

(c) the applicability is restricted to the case when the wheel load is centrally placed

(d) the dispersion of load is considered through the wearing coat only

Q. A T-beam roof section has the following particulars:

Thickness of slab = 100 mm

Width of rib = 300 mm

Depth of beam = 500 mm

Centre to centre distance of beams = 3.0 m

Effective span of beams = 6.0 m

Distance b/w points of contraflexure = 3.60 m.

The effective width of flange of beam is

(a) 3000 mm   c. 1900 mm

(b) 1600 mm   d. 1500 mm

Q. Given that d = effective depth; b = width and D = overall depth, the maximum area of compression inforcement in a beam is

(a) 0.04 bd
(b) 0.04 bd
(c) 0.12 bd
(d) 0.12 bD

Q. A reinforced concrete slab is 75 mm thick. The maximum size of reinforcement bar that can be used is

(a) 12 mm diameter

(b) 10 mm diameter

(c) 8 m diameter

(d) 6 mm diameter

Q. In the design of two-way slab restrained at all edges, torsional reinforcement required is

(a) 0.75 times the area of steel provided at midspan in the same direction

(b) 0.375 times the area of steel provided at midspan in the same direction

(c) 0.375 times the area of steel provided in the shorter span

(d) Nil

Q. Side face reinforcement is provided in a beam when the depth of web exceeds

(a) 300 mm

(b) 450 mm

(c) 500 mm

(d) 750 mm

Q. A reinforced cantilever beam of span 4m, has a cross-section of 150 x 500 mm. If checked for lateral stability and deflection, the beam will

(a) Fail in deflection only

(b) Fail in lateral stability only

(c) Fail in both deflection and lateral stability

(d) Satisfy the requirements of deflection and lateral stability

Q. In the limit state method of design, the failure criterion for reinforced concrete beams and columns is

(a) Maximum principal stress theory

(b) Maximum principal strain theory

(c) Maximum shear stress theory

(d) Maximum strain energy theory

Q. In a RCC beam of breadth b and overall depth D exceeding 750 mm, side face reinforcement required and the allowable area of maximum tension reinforcement shall be respectively.

(a) 0.2% and 0.02 bD

(b) 0.3% and 0.03 bD

(c) 0.1 % and 0.04 bD

(d) 0.4% and 0.01 bD

Q. The effective width "b_f" of flange of a continuous T-beam in a floor system is given by $b_f = l_0 /6+b_w + 6$ Of where 10 represents the

(a) Distance between point of contraflexure in a span
(b) Effective span of beams
(c) Clear span of beams
(d) spacing between beams

Q. A doubly reinforced beam is considered less economical than a singly reinforced beam because

(a) Tensile steel required is more than that for a balanced section

(b) Shear reinforcement is more

(c) Concrete is not stressed to its full value

(d) Compressive steel is under-stressed

Q. According to Whitney's theory, the maximum depth of concrete stress block in a balanced RCC beam section of depth 'd' is

(a) 0.3 d

(b) 0.43 d

(c) 0.5 d

(d) 0.53 d

Q. In the design of as masonry retaining wall, the

A. Vertical load should fall within the middle-third of base width

B. Horizontal thrust should act as h/3 from base

C. Resultant load should fall within a distance of one-sixth of base width on either side of its midpoint

D. Resultant load should fall within a distance of one-eight of base width on either side of its midpoint

Q. Which of the following deformations are important in case of deep beams when compared to flexure alone?

(a) shear
(b) axial
(c) torsional
(d) bearing

Q. As the span of a bridge increases, the impact factor

(a) decreases

(b) increases

(c) remains constant

(d) increases upto a critical value of span and then decrease

Q. A reinforced concrete beam is subjected to the following bending moments:

Dead load 20 kNm

Live load 30 kNm

Seismic load 10 kNm

The design bending moment for limit state of collapse is

(a) 60 kNm

(b) 75 kNm

(c) 72 kNm

(d) 80 kNm

Q. Which one of the following statements is correct? Doubly reinforced beams are recommended when

(a) the depth of the beam is restricted
(b) the breadth of the beam is restricted
(c) both depth and breadth are restricted
(d) the shear is high

Q. Match List-I (Beam Variable) with List-II (Design Provision) and select the correct answer using the codes:

List – I	List – II
A. Flexure	1. Minimum depth of section
B. Shear	2. Longitudinal steel reinforcement
C. Bond	3. Stirrups
D. Deflection	4. Anchorage in support

Codes:

a. A – 3, B – 2, C – 1, D – 4
b. A – 2, B – 3, C – 1, D – 4
c. A – 3, B – 2, C – 4, D – 1
d. A – 2, B – 3, C – 4, D – 1

Q. Drop panel is a structural component in

(a) Grid floor

(b) Flat plate

(c) Flat slab

(d) Slab-beam system of floor

Q. A doubly reinforced concrete beam has effective cover d' to the centre of compression reinforcement X_u is the depth of neutral axis, and d is the effective depth to the centre of tension reinforcement. What is the maximum strain in concrete at the level of compression reinforcement?

(a) 0.0035 (1 - d'/d)

(b) 0.0035 (1 - d'/x$_u$)

(c) 0.002 (1 - d'/x$_u$)

(d) 0.002 (1 - d'/d)

Q. Consider the following statements:

In an under reinforced concrete beam,

1. Actual depth of neutral axis is less than the critical depth of neutral axis

2. Concrete reaches ultimate stress prior to steel reaching the ultimate stress

3. moment of resistance is less than that of balanced sections

4. lever arm of resisting couple is less than that of balanced sections

Which of the statements given above are correct?
(a) 1 and 2
(b) 1 and 3
(c) 2, 3 and 4
(d) 1 and 4

Q. The cover of longitudinal reinforcing bar in a beam subjected to sea spray should not be less than which one of the following?

(a) 30 mm
(b) 70 mm
(c) 75 mm
(d) 80 mm

Q. When is an R.C.C. roof slab designed as a two way slab?

(a) If the slab is continuous over two opposite edges only

(b) If the slab is unsupported at one edge only

(c)If the ratio of spans in two directions is >2

(d) If the ratio of spans in two directions is <2

Q. In a single reinforced beam, the tensile steel reaches its maximum allowable stress earlier than concrete. What is such a section known as?

(a) Under-reinforced section

(b) Over-reinforced section

(c) Balanced section

(d) Economic section

Q. Why is the design of a R.C. section as over-reinforced undesirable?

(a) It consumes more concrete

(b) It undergoes high strains

(c) It fails suddenly

(d) Its appearance is not good

Q. What shall be the maximum area of reinforcement (i) in compression and (ii) in tension to be provided in an RC beam, respectively, as per IS456?

(a) 0.08% and 2%
(b) 2% and 4%
(c) 4% and 2%
(d) 4% and 4%

Q. In limit state design method, the moment of resistance for a balanced section using M20 grade concrete and HYSD steel of grade Fe 415 is given by $M_{n.lim} = Kbd^2$, what is the value of 'K'?

(a) 2.98

(b) 2.76

(c) 1.19

(d) 0.89

Q. How is the base-level bending moment of a cantilever retaining wall expressed as a function of its height H?

a. H^1

b. H^2

c. H^3

d. H^4

Q. The maximum percent of moment redistribution allowed in RCC beams is

(a) 10%

(b) 20%

(c) 30%

(d) 40%

Q. The minimum strain at failure in the tensile reinforcement (fy = 400 MPa) of RCC beam as per limit state method is

(a) 0.0020
(b) 0.0028
(c) 0.0037
(d) 0.0045

Q. Minimum clear cover in mm to the main steel bars in slab, beam, column and footing respectively, are

(a)   10, 15, 20 and 25

(b)   (b) 15, 25, 40 and 75

(c) 20, 25, 30 and 40

(d)   20, 35, 40 and 75

Q. For a continuous slab of 3m x 3.5m size, the minimum overall depth of slab to satisfy vertical deflection limits is

(a) 120 mm
(b) 100 mm
(c) 75 mm
(d) 50 mm

Q. A reinforced concrete slab is 75 mm thick. The maximum size of reinforcement bar that can be used is

(a) 6mm diameter
(b) 8mm diameter
(c) 10mm diameter
(d) 12mm diameter

Q. A simply supported beam has an effective span of 16m. What shall be the limiting ratio of span to effective depth as per IS 456-2000?

(a) 26
(b) 20
(c) 12.5
(d) 7

Q. A simply supported beam is considered as a deep beam if the ratio of effective span to overall depth is less than

a. 1

b. 2

c. 3

d. 4

Q. Splicing of rebars in RCC beams can be done at section where

(a)   bending moment is zero

(b)   bending moment is less than half of the maximum bending moment in beam

(c) bending moment is maximum

(d)   shear force is zero

Q. Critical section for shear in case of flat slabs is

(a) at a distance of effective depth of slab from the periphery of the column/the drop panel

(b) at a distance of % from the periphery of the column/the capital/the drop panel

(c) at the drop panel of the slab

(d) at the periphery of the column [adopting standard notations]

Q. The enlarged head of the supporting column of a flat slab is called

(a) capital
(b) drop
(c) panel
(d) block

Q. The limits of percentage p of the longitudinal reinforcement in a column is

(a) 0.15% to 2%

(b) 0.8% to 4%

(c) 0.8% to 6%

(d) 0.8% to 8%

Q. The load carrying capacity of column designed by working stress method is 500 kN. The collapse load of the column is

(a) 500.0 kN
(b) 662.5 kN
(c) 750.0 kN
(d) 1100.0 kN

Q. The reduction coefficient of a reinforced concrete column with an effective length of 4.8 m and size 250 x 300 mm is

(a) 0.80
(b) 0.85
(c) 0.90
(d) 0.95

Q. The maximum spacing of vertical reinforcement in RCC wall should NOT exceed.

(a) The thickness of wall

(b) 1.5 times the thickness of wall

(c) 2 times the thickness of wall

(d) 3 times the thickness of wall

Q. In an axially loaded spirally reinforced short column, the concrete inside the core is subjected to

(a) Bending and compression
(b) Biaxial compression
(c) Triaxial compression
(d) Uniaxial compression

Q. Which of the following are the additional moments considered for design of slender compression member in lieu of deflection in x and y directions?

(a) $\dfrac{P_u l_{ex}^2}{2000D}$ and $\dfrac{P_u l_{ey}^2}{2000D}$

c. $\dfrac{P_u l_{ex}}{2000}$ and $\dfrac{P_u l_{ey}}{2000}$

(b) $\dfrac{P_u l_{ex}^2}{2000D}$ and $\dfrac{P_u l_{ey}^2}{2000b}$

d. $\dfrac{P_u l_{ex}^2}{200D}$ and $\dfrac{P_u l_{ey}^2}{200b}$

**(where P_U is axial load; L_{ex} and l_{ey} are effective lengths in respective directions; D depth of section perpendicular to
major axis; b width of the member)**

Q. A square column section of size 350 mm x 350 mm is reinforced with four bars of 25 mm diameter and four bars of 16 mm diameter. Then the transverse steel should be

(a) 5 mm dia @ 240 mm c / c

(b) 6 mm dia @ 250 mm c / c

(c) 8 mm dia @ 250 mm c / c

(d) 8 mm dia @ 350 mm c / c

Q. An axially loaded column is of 300 x 300 mm size. Effective length of column is 3 m. What is the minimum eccentricity of the axial load for the column?
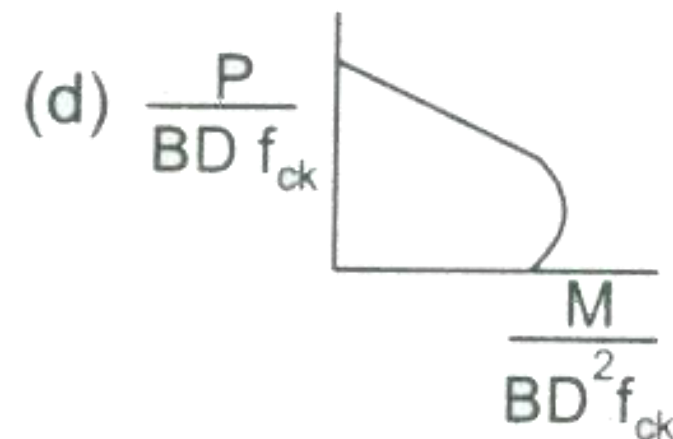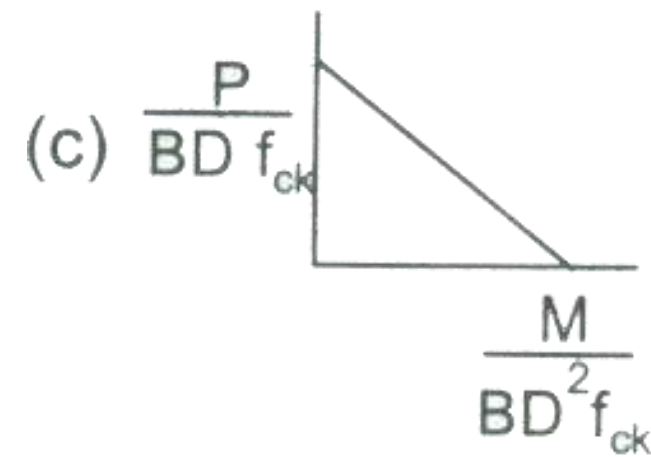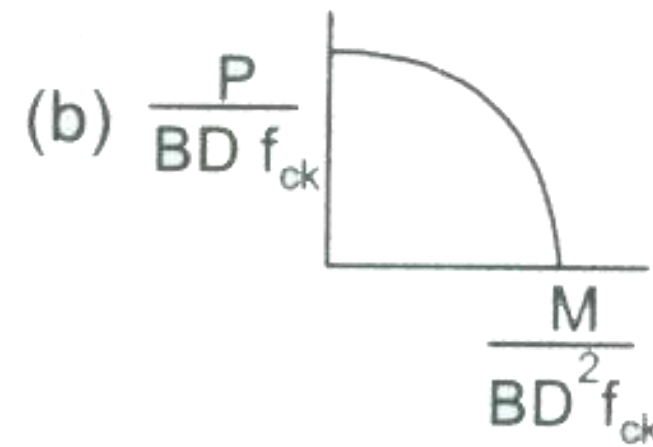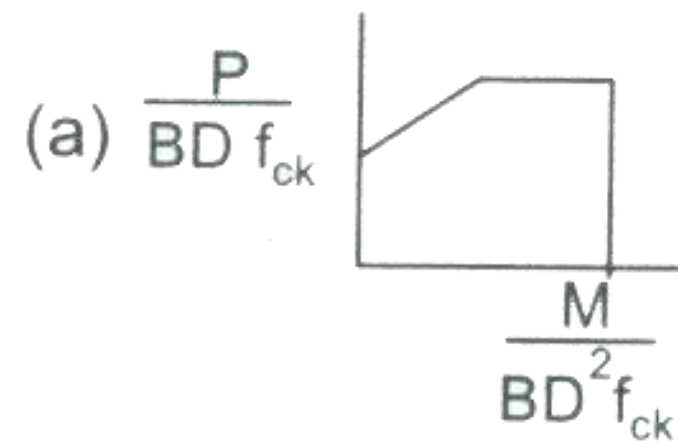
(a) 0

(b) 10 mm

(c) 16 mm

(d) 20 mm

Q. A rectangular reinforced column (8 x D) has been subjected to uniaxial bending moment M and axial load P. Characteristic strength of concrete = f_{ck}' Which one among the following column design curves shows the relation between M and P qualitatively?

(a) $\dfrac{P}{BD\, f_{ck}}$ vs $\dfrac{M}{BD^2 f_{ck}}$

(b) $\dfrac{P}{BD\, f_{ck}}$ vs $\dfrac{M}{BD^2 f_{ck}}$

(c) $\dfrac{P}{BD\, f_{ck}}$ vs $\dfrac{M}{BD^2 f_{ck}}$

(d) $\dfrac{P}{BD\, f_{ck}}$ vs $\dfrac{M}{BD^2 f_{ck}}$

Q. The purpose of lateral ties in short R.C. columns is to

(a) Increase the load carrying capacity of column
(b) Facilitate compaction of concrete
(c) Facilitate construction
(d) Avoid buckling of longitudinal bars

Q. Which one of the following represents the ratio of volume of helical reinforcement to volume of core?

(a) $0.36 \left(\frac{A_g}{A_c} - 1 \right) \frac{f_{ck}}{f_y}$

(b) $0.36 \left(\frac{A_g}{A_s} - 1 \right) \frac{f_{ck}}{f_y}$

(c) $0.36 \left(\frac{A_s}{A_c} - 1 \right) \frac{f_{ck}}{f_y}$

(d) $0.36 \left(\frac{A_c}{A_s} - 1 \right) \frac{f_{ck}}{f_y}$

where A_g, As and Ac are gross cross-sectional area of the member, area of steel and core area; and f_{CK} and f_Y are characteristic strength of concrete and steel respectively.

Q. A wall carries an axial load, 12 kN/m and also an eccentric load of 27 kN/m at 72 mm from the central axis of the wall. The equivalent eccentricity e is nearly

(a) 65 mm
(b) 60 mm
(c)55 mm
(d) 50 mm

Q. Given that φ is angle of internal friction, 'p' is the safe bearing capacity and 'y' is the unit weight of soil, the maximum depth of foundation of a masonary footing is given by

(a) $\dfrac{p}{y}\left(\dfrac{1+\sin\Phi}{1-\sin\Phi}\right)$

(b) $\dfrac{p}{y}\left(\dfrac{1-\sin\Phi}{1+\sin\Phi}\right)$

(c) $\dfrac{p}{y}\left(\dfrac{1+\sin\Phi}{1-\sin\Phi}\right)^{2}$

(d) $\dfrac{p}{y}\left(\dfrac{1-\sin\Phi}{1+\sin\Phi}\right)^{2}$

Q. The critical section for two-way shear of footing is at the

(a) Face of the column

(b) Distance d from the column face

(c) Distance d/2 from the column face

(d) Distance 2d from the column face

(Where d is the effective depth of the footing)

Q. In the case of isolated square concrete footing, match the locations at which the stress resultants are to be checked, where d is effective depth of footing and select the correct answer using the code given below the lists:

Stress Resultant	Location
A. Bending moment	1. At face of column
B. One way shear	2. At d/2 from face of column
C. Punching shear	3. At d from face of column

Codes:

a. A – 1, B – 2, C – 3   c. A – 3, B – 1, C – 2

b. A – 1, B – 1, C – 3   d. A – 1, B – 3, C – 2

Q. The critical section for maximum bending moment in the footing under masonry wall is located at

(a) the middle of the wall

(b) the face of the wall

(c) mid-way between the face and the middle of the wall

(d) a distance equal to the effective depth of footing from the face of the wall

Q. A concrete column carries an axial load of 450 kN and a bending moment of 60 kNm at its base. An isolated footing of size 2 m x 3 m with the 3 m side along the plane of the bending moment is provided under the column. Centres of gravity of the column and the footing coincide. The net maximum and minimum pressures, in kPa, on the soil under the footing are, respectively

(a) 95 and 75   c. 75 and 55

(b) 95 and 55   d. 75 and 75

Q. Minimum thickness of load bearing RCC wall should be:

(a) 5 cm

(b) 10 cm

(c) 15 cm

(d) 20 cm

Q. For wall column and vertical faces of all the structural members, the form work is generally removed after

(a) After 24 to 48 hours,
(b) After 3 days
(c) After 7 days
(d) After 14 days

Q. As per IS:456-2000, the organic content of water used for making concrete should not be more than:

(a) 200 mg/L
(b) 250 mg/L
(c) 100 mg/L
(d) 150 mg/L

Q. The maximum quantity of cement content needed in one m³ of a reinforcement concrete which is exposed to sea weather conditions is (in kg).

(a) 350

(b) 200

(c) 250

(d) 300

Q. According to IS:456, the number of grades of concrete mixes is-

(a) 3
(b) 4
(c) 5
(d) 7

Q. How does an increases in the pitch of the roof affects the amount of load that can be placed on it?

(a) It increases
(b) It decreases
(c) Remains constant
(d) Depends upon case

Q. The length of the straight portion of a bar beyond the end of the hook should be at least

(a) Twice the diameter
(b) Thrice the diameter
(c) Four times the diameter
(d) Seven times the diameter

Q. Tension bars in a cantilever beam must be enclosed in the support up to:

(a) L_d

(b) $L_d/3$

(c) 12φ

(d) d

Q. The bearing stress at bends for limit state method compared to working stress method of design is

(a) 1.5 times more
(b) 2.5 times more
(c) 2.5 times less
(d) 1.5 times less

Q. Bending moment co-efficient and shear co-effective for continuous beams of uniform cross-section as per IS:456 (table 12 and 13) may be used only when spans do not differ to the longest span by:

(a) 15%
(b) 20%
(c) 10%
(d) 12%

Q. Spacing of stirrup in a rectangular beam is:

(a) Increased at the ends
(b) Kept constant throughout the length
(c) Decreased towards the centre of the beam.
(d) Increased towards the centre of the beam.

Q. The thickness of the flange of T-beam of a ribbed slab is assumed is

(a) Half the thickness of the rib
(b) Thickness of the concrete topping
(c) Depth of the rib
(d) Width of the rib

Q. For initial estimate for a beam design, the width is assumed

(a) 1/15th of the span
(b) 1/20th of the span
(c) 1/25th of the span
(d) 1/30th of the span

Q. The length of a cranked bar through a distance (d) at 45° in case of a beam of effective length L, and depth (d) is

(a) L+0.42d
(b) L+2x0.42d
(c) L-0.42d
(d) L-2x0.42d

Q. If the size of panel in a flat slab is 6 m x 6m, then as per Indian Standard code, the widths of column strip and middle strip are

(a) 3.0 m and 1.5 m
(b) 1.5 m and 3.0 m
(c) 3.0 m and 3.0 m
(d) 1.5 m and 1.5 m

Q. If l_1 and l_2 are the lengths of long and short spans of a two way slab simply supported on four edges and carrying a load w per unit area, the ratio of the loads split into and w_2 acting on strips parallel to l_2 and l_1 is

(a) $\dfrac{w_1}{w_2} = \dfrac{l_2}{l_1}$

(b) $\dfrac{w_1}{w_2} = \left(\dfrac{l_2}{l_1} \right)^2$

(c) $\dfrac{w_1}{w_2} = \left(\dfrac{l_2}{l_1} \right)^3$

(d) $\dfrac{w_1}{w_2} = \left(\dfrac{l_2}{l_1} \right)^4$

Q. According to IS:456,slabs which span in two directions with corners held down are assumed to be divided in each direction into middle strips and edge strips such that the width of the middle strip is_____.

(a) Half of the width of the slab
(b) Two-third of the width of the slab
(c)Three-fourth of the width of the slab
(d) Four-fifth of the width of the slab

Q. The diameter of the column head support a flat slab, is generally kept_____.

(a) 0.25 times the span length
(b) 0.25 times the diameter of the column
(c) 4.0 cm larger than the diameter of the column
(d) 5.0 cm larger than the diameter of the column

Q. The breadth of a ribbed slab containing two bars must be between

  (a) 6 cm to 7.5 cm
  (b) 8 cm to 10 cm
  (c) 10 cm to 12 cm
  (d) None of these

Q. The effective span of a simply slab is

(a) Distance between the centers of the bearings

(b) Clear distance between the inner faces of the walls

(c) Clear span plus effective depth of the slab

(d) None of these