

### Introduction

- Q.1** The values of partial safety factor for dead load and live load in limit state of collapse are  
(a) 1.5 and 1.1 (b) 1.5 and 1.0  
(c) 1.0 and 1.5 (d) 1.5 and 1.5
- Q.2** In the limit state of collapse, the values of partial safety factor for concrete and steel are  
(a) 1.67 and 0.87 (b) 1.5 and 1.15  
(c) 1.15 and 1.5 (d) 0.87 and 1.67
- Q.3** The minimum strain in concrete at the outer most compression fibre in the limit state design of flexure is  
(a) 0.003 (b) 0.002  
(c) 0.0035 (d) 0.0015
- Q.4** The maximum strain in tension reinforcement in the section at failure, in limit state of collapse, shall not be less than  
(a)  $\frac{f_y}{E_s} + 0.002$  (b)  $\frac{0.87f_y}{E_s} + 0.002$   
(c)  $\frac{0.87f_y}{E_s} + 0.0035$  (d)  $\frac{f_y}{E_s} + 0.0035$
- Q.5** The maximum compressive strain in concrete in axial compression in limit state of collapse is  
(a) 0.0035 (b) 0.0015  
(c) 0.0025 (d) 0.002
- Q.6** Meridional thrust in a spherical dome subjected to a concentrated load or uniformly distributed load, is always  
(a) tensile (b) compressive  
(c) zero (d) none of the above
- Q.7** Which type of wires have high tensile strength?  
(a) Heat treated wires  
(b) Plain cold drawn wires  
(c) Plain hot drawn wires  
(d) None of the above

- Q.8** Sinking of an intermediate support of a continuous beam  
1. reduces the negative moment at support.  
2. increases the negative moment at support.  
3. reduces the positive moment at centre of span.  
4. increases the positive moment at centre of span.  
Which of these statements is/are correct?  
(a) 1 and 3 (b) 1 and 4  
(c) 2 and 3 (d) 2 and 4
- Q.9** In a counterfort retaining wall, the main reinforcement is provided on the  
1. bottom face in front counterfort  
2. inclined face in front counterfort  
3. bottom face in back counterfort  
4. inclined face in back counterfort  
Which of these statements are correct?  
(a) 1 and 2 (b) 2 and 3  
(c) 1 and 4 (d) 3 and 4
- Q.10** Match List-I with List-II and select the correct answer using the codes given below the lists:  
List-I  
A. Continuous bridge  
B. Causeways  
C. Economic span  
D. Viaduct  
List-II  
1. Used for deciding the number of piers  
2. Bridge to enable road to pass over a cutting  
3. Used for large spans  
4. To allow flood water to pass over  
Codes:  
A B C D  
(a) 3 4 1 2  
(b) 1 2 3 4  
(c) 3 1 4 2  
(d) 1 3 2 4

- Q.11** Which of the following are not dependent on the applied load?  
1. Elastic strain  
2. Creep strain  
3. Drying shrinkage strain  
4. Carbonation shrinkage  
Select the correct answer using the codes given below:  
(a) 1 and 2 (b) 2 and 3  
(c) 3 and 4 (d) 1 and 4

**Directions:** The following items consists of two statements; one labelled as 'Assertion (A)' and the other as 'Reason (R)'. You are to examine these two statements carefully and select the answers to these items using the codes given below:

- Codes:**  
(a) both A and R are true and R is the correct explanation of A  
(b) both A and R are true but R is not a correct explanation of A  
(c) A is true but R is false  
(d) A is false but R is true

- Q.12** Assertion (A) : The load factor for live load is greater than that for dead load.  
Reason (R) : The live loads are more uncertain than dead loads.

- Q.13** Assertion (A) : For determining uniaxial compressive strength of concrete, cube is a better test specimen as compared to cylinder.  
Reason (R) : Stress distribution is more uniform over the cross-section of a cylinder as compared to cube.

- Q.14** Assertion (A) : The stress block used in the limit state design method is obtained by testing of concrete cylinder under uniform rate of strain.  
Reason (R) : If a uniform rate of strain is not adopted it is not possible to obtain the descending portion of stress-strain curve beyond maximum stress.

- Q.15** 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.16** Match List-I with List-II and select the correct answer using the codes given below the lists :  
List-I

- A. Moment and shear coefficients  
B. Fire resistance  
C. Sliding  
D. Span to depth ratio of beam

List-II

1. Durability  
2. Stability  
3. Analysis of structure  
4. Deflection limits

**Codes:**

- |     | A | B | C | D |
|-----|---|---|---|---|
| (a) | 4 | 2 | 1 | 3 |
| (b) | 3 | 2 | 1 | 4 |
| (c) | 4 | 1 | 2 | 3 |
| (d) | 3 | 1 | 2 | 4 |

- Q.17** In ultimate load design method, the load factors for dead load and live load are  
(a) 2.2 and 1.5 (b) 1.5 and 1.0  
(c) 1.5 and 2.2 (d) 1.0 and 1.5

- Q.18** The modulus of elasticity of cement concrete can be assumed as per IS 456 : 2000 as:  
(a)  $5000\sqrt{f_{ck}}$  (b)  $5700\sqrt{f_{ck}}$   
(c)  $6300\sqrt{f_{ck}}$  (d)  $7200\sqrt{f_{ck}}$

- Q.19** Given that  $d$  = effective depth,  $b$  = width and  $D$  = overall depth, the maximum area of compression reinforcement in a beam is  
(a)  $0.04bd$  (b)  $0.04bD$   
(c)  $0.12bd$  (d)  $0.12bD$

- Q.20** According to IS : 456, the partial safety factor for concrete is taken as  
(a) 0.87 (b) 1.15  
(c) 1.50 (d) 3.00

- Q.21** The most economical type of RCC beam is  
(a) singly reinforced rectangular beam.  
(b) singly reinforced T-beam.  
(c) doubly reinforced rectangular beam.  
(d) doubly reinforced T-beam.

- Q.22 The distance between main bars in a simply supported slab should not exceed by  
 (a) three times of effective depth.  
 (b) four times of effective depth.  
 (c) five times of effective depth.  
 (d) six times of effective depth.

- Q.23 A simply supported beam is considered a deep beam if the ratio of effective span to overall depth is less than

- (a) 1 (b) 4  
 (c) 3 (d) 2

- Q.24 Poisson's ratio of concrete

- (a) remains constant.  
 (b) increases with richer mixes.  
 (c) decreases with richer mixes.  
 (d) None of the above.

- Q.25 As the span of a bridge increases, how does the impact factor vary?

- (a) Increases  
 (b) Constant

#### Answers Introduction

1. (d) 2. (b) 3. (c) 4. (b) 5. (d) 6. (b) 7. (b) 8. (b) 9. (a) 10. (a)  
 11. (c) 12. (d) 13. (d) 14. (a) 15. (b) 16. (d) 17. (c) 18. (a) 19. (b) 20. (c)  
 21. (d) 22. (a) 23. (d) 24. (b) 25. (c) 26. (c) 27. (a)

#### Explanations Introduction

5. (d)  
 Refer clause 39.1 of IS 456 : 2000.  
 13. (d)  
 Cylinder is a better test specimen as compared to cube for determining uniaxial compressive strength of concrete since restraining effect of plates is less in case of cylinder as compared to cube.

- (c) Decreases  
 (d) Increase upto critical value and then decreases

- Q.26 Match List-I with List-II and select the correct answer using the codes given below the lists :

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

Codes:

A	B	C	D
(a) 3	1	4	2
(b) 2	1	4	3
(c) 2	4	1	3
(d) 2	4	1	3

- Q.27 With the increase in rate of loading during testing, compressive strength of concrete

- (a) Increases.  
 (b) does not change.  
 (c) decrease.  
 (d) none of the above.

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Concrete in sea water or exposed directly along the sea coast shall be at least M20 grade in the case of plain concrete and M30 in case of reinforced concrete. The use of slag or pozzolana cement is advantageous under such conditions.

18. (a)  
 As per IS 456 : 2000  
 The modulus of elasticity of cement concrete is assumed as

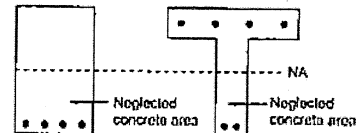
$$E_c = 5000 \sqrt{f_{ck}}$$

where,  $f_{ck}$  = Characteristic strength of concrete  
 Hence option (a) is correct.

19. (b)  
 As per IS 456 : 2000 maximum area of compression or tension reinforcement shall not exceed  $0.04bD$ .

20. (c)  
 As per IS 456 : 2000, the recommended partial factor of safety are:  
 For concrete = 1.50  
 For steel = 1.15  
 Hence option (c) is correct.

21. (d)  
 Tensile strength of concrete is assumed to zero. So the concrete below NA is neglected i.e. not contributed in moment resistance.



Thus there is saving in concrete in T-beam. So most economical type of RCC beam is doubly reinforcement T-beam.

22. (a)  
 As per IS 456 : 2000  
 Spacing of reinforcement in slab.  
 (i)  $3d$  or 300 mm for main bar  
 (ii)  $5d$  or 450 mm for distribution bars  
 where  $d$  = effective depth of slab in mm  
 Hence option (a) is correct.  
 23. (d)  
 Beams with large depths in relation to span are called deep beams. As per IS: 456-2000.  
 Clause 29, a simply supported beam is classified as deep when the ratio of its effective span  $l_{eff}$  to overall depth  $D$  is less than 2. Continuous beams are considered as deep when the ratio  $\frac{l_{eff}}{D}$  is less than 2.5.  
 For simply supported:  $\frac{l_{eff}}{D} < 2$   
 For continuous beam:  $\frac{l_{eff}}{D} > 2.5$   
 where  $l_{eff}$  = min {centre to distance between supports or 1.15 times the clear span}  
 Hence option (d) is correct.  
 24. (b)  
 Poisson's ratio of concrete increase with richer mixer.  
 25. (c)  
 Impact factor =  $\frac{A}{B+L}$

27. (a)  
 The compressive strength of concrete increases with rate of loading during testing. At low rates of loading there is more time for creep to occur, so that increase of strength with rate of loading provide evidence for the theory that failure occurs at limiting values of strain rather than stress.

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Exposure	Minimum grade of plain concrete	Minimum grade of reinforced concrete
(i) Mild	—	M20
(ii) Moderate	M15	M25
(iii) Severe	M20	M30
(iv) Very severe	M20	M35
(v) Extreme	M25	M40