1. The maximum deflection of a fixed beam carrying a central load W is equal to

A. $\frac{WL^3}{48EI}$

B. $\frac{WL^3}{96EI}$

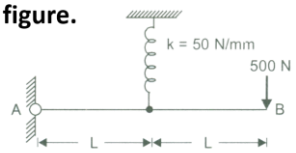
C. $\frac{WL^3}{192EI}$

D. $\frac{5}{384}\frac{WL^3}{EI}$

2. According to Rankine's hypothesis, the criterion of a brittle material is

a. Maximum principal stress
b. Maximum stress shear
c. Maximum strain energy
d. Maximum shear strain energy

3. A rigid bar is supported by a spring as shown in the given figure.




The deflection of the point B will be

a. 10 mm upward
b. 20 mm download
c. 5 mm upward
d. 40 mm download

4. The diagram showing the variation of axial load along the span is called

a. Shear force diagram
b. Bending moment diagram
c. Thrust diagram
d. Influence line diagram

5. A simply supported beam is loaded as shown in the given figure. The bending moment at E would be


a. 6 t-m (Sagging)
b. 4 t-m (Hogging)
c. 6 t-m (Hogging)
d. 4 t-m (Sagging)

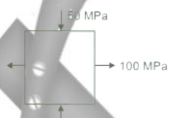
6. The maximum bending moment due to a moving load on a fixed ended beam occurs

a. At a support
b. Always at the midspan
c. Under the load only
d. None of the above

7. Consider the following statements:
A simply-supported beam is subjected to a couple somewhere in the span. It would produce
1. A rectangular SF diagram.
2. Parabolic BM diagrams.
3. Both (+) ve and (-) BMs which are maximum at the point of application of the couple

Of these statements
a. 1, 2, and 3 are correct
b. 1 and 2 are correct
c. 2 and 3 are correct
d. 1 and 3 are correct

8. For the state of stress shown in the above figure, normal stress acting on the plane of maximum shear stress is




a. 25 Mpa compression
b. 75 Mpa compression
c. 25 Mpa tension
d. 75 Mpa tension

9. A beam of rectangular cross-section is 100 mm wide and 200 mm deep. If the section is subjected to a shear force of 20kN, then the maximum shear stress in the section is

a. 1 N/mm²
b. 1.125 N/mm²
c. 1.33 N/mm²
d. 1.5 N/mm²

10. The figure shown the stress condition of an element, the principal stresses are


a. $\pm 2\tau$
b. $\pm \tau/2$
c. $\pm \tau$
d. $\pm 2\tau/3$

11. A cantilever beam carries a uniformly distributed load from fixed end to the centre of the beam in the first case and a uniformly distributed load of same intensity from centre second case. The ratio of deflections in the two cases is

a. ½
b. 3/11
c. 5/24
d. 7/41

12. A mild steel flat subjected to tensile force of 84 tonnes is connected to a gusset plate using rivets. If the force required to shear a single rivet and to tear the plate per pitch length are 5000 kg, 8000 kg and, 6000 kg respectively, then the number of rivets required is

a. 12
b. 14
c. 16
d. 17

13. If the deflection at the free end of a uniformly loaded cantilever beam is 15mm and the slope of the deflection curve at the free end is 0.02 radian, then the length of the beam is

a. 0.8 m
b. 1m
c. 1.2 m
d. 1.5m

14. The effective length of the fillet weld is

a. Total length – 2 x throat size
b. Total length – 2 x weld size
c. 0.7 x total length
d. Total length – weld size / √2

15. Effective length of a column fixed at one end and hinged at the other end is

a. ½
b. 1/√2
c. 2 1
d. √2 1

Where 1 is the actual length of the column

16. A welded fillet joint of length 'L' can be subjected to maximum load of ($f_s$ = fillet size and $P_{ss}$ = permissible shear stress)
    a. $(f_s \times L \times P_{ss})/3$
    b. $f_s \times L \times P_{ss}$
    c. $(0.7)(f_s \times L \times P_{ss})/3$
    d. $2(f_s \times L \times P_{ss})$

17. Bearing stiffener in a plate girder is used to
    a. Transfer the load from the top flange to the bottom one
    b. Prevent bucking of web
    c. Decrease the effective depth of web
    d. Prevent excessive deflection

18. For field rivets, the permissible stresses are reduced by what percentage ?
    a. 10 %
    b. 15 %
    c. 25 %
    d. 33 1/3 %

19. Gantry girder are designed to resist
    a. Lateral loads
    b. Longitudinal loads and vertical loads
    c. Lateral, Longitudinal and vertical loads
    d. Lateral, and Longitudinal loads

20. In the case of an axially loaded machined for full bearing the fastening connecting the column to the base plates in gusseted base are designed for
    a. 100 % of the column load
    b. 50 % of the column load
    c. 25 % of the column load
    d. Erection conditions only

21. The relation between intensity of wind pressure p and velocity of wind V is taken as
    a. $P \alpha V$
    b. $P \alpha V^2$
    c. $P \alpha (1/V)$
    d. $P \alpha V^{1/2}$

22. What is the maximum slenderness ratio for a steel member carrying compressive loads resulting from dead load and imposed loads?
    a. 180
    b. 250
    c. 350
    d. 400

16. The live load for a sloping roof with slope 15°, where access is not provided to roof, is taken as
    a. 0.65 kN/m²
    b. 0.75 kN/m²
    c. 1.35 kN/m²
    d. 1.50 kN/m²

24. If $f_{eu}$ 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) $\frac{F_y}{1.15E_s} + 0.002$

25. Consider the following statements regarding tensile test diagrams for carbon steels with varying carbon contents :
    As the carbon contents increases
    a. The ultimate strength of steel decreases.
    b. The elongation before fracture increases.
    c. The ductility of the metal decreases.
    d. The ultimate strength increases.

    Of these statements
    a. 3 and 4 are correct
    b. 1 and 3 are correct
    c. 1,2 and 3 are correct
    d. 1 and 2 are correct

26. The assumption that the plane sections normal before bending remain normal after bending is used.
    (a) Only in the working stress method of design
    (b) Only in the limit-state method of design
    (c) In both working stress and limit-state methods of design
    (d) Only in the ultimate load method of design

27. In plastic analysis for flexure , which of the following pairs of shape of section and shape factor are correctly matched ?
    1. I..... 1.4
    2. Square..... 1.5
    3. Rectangle.....1.5
    4. Circle.....1.7
    Select the correct answer using the codes given below:
    codes:
    a. 1 ,2 and 3
    b. 2,3 and 4
    c. 3 and 4
    d. 1 and 2

28. 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. $\frac{m}{m-r} \cdot D$
    B. $\frac{m}{m+r} \cdot D$
    C. $\frac{m+r}{m} \cdot D$
    D. $\frac{m}{r} \cdot D$

29. A welded steel plate girder consisting of two flange plates of 350 mm x 16 mm and a web plate of 1000 mm x 6 mm, requires
    a. No stiffeners
    b. Vertical stiffeners
    c. Intermediate vertical stiffeners
    d. Vertical and horizontal stiffeners

30. 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

31. The centroid of compressive force, from the extreme compression fibre, in limit state design lies at a distance of
    a. $0.367 x_u$
    b. $0.416 x_u$
    c. $0.446 x_u$
    d. $0.573 x_u$

    where $x_u$ is the depth of neutral axis at the limit state of collapse

32. 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

33. The maximum shear stress for M15 concrete as per Is : 456-1978 in limit state design is

a. 2 . 5 N/mm²
b. 2 . 8 N/mm²
c. 3 . 1 N/mm²
d. 3 . 5 N/mm²

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

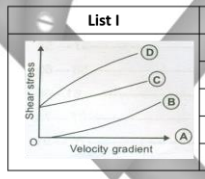
(a) 12 mm diameter
(b) 10 mm diameter
(c) 8 m diameter
(d) 6 mm diameter

35. The development length of bars of diameter ϕ, as per Is : 456 -1978 is given by

a. $\frac{4\Phi\alpha_s}{\tau_{bd}}$
b. $\frac{\Phi\alpha_s}{4\tau_{bd}}$
c. $\frac{2\Phi\alpha_s}{3\tau_{bd}}$
d. $\frac{\Phi\alpha_s}{3\tau_{bd}}$

Where $\sigma_s$ = stress in bar
$\tau_{bd}$ = design bond stress

36. Match List I (curves labelled A, B, C and D in figure) with List II (types of fluid) and select the correct answer:




| List I | List II |
|---|---|
| | 1. Ideal plastic |
| | 2. Ideal |
| | 3. Non-Newtonian |
| | 4. Pseudoplastic |
| | 5. Thixotropic |

A B C D
a. 2 3 1 5
b. 3 2 1 5
c. 4 2 1 1
d. 2 3 5 1

37. The creep strain are

a. Caused due to dead loads only
b. Caused due to live loads only
c. Caused due to both dead loads and live loads
d. Independent of loads

38. Which one of the following expresses the height of rise or fall of a liquid in a' capillary tube

a. $\frac{4wd}{\sigma\cos\alpha}$
b. $\frac{\sigma\cos\alpha}{4wa}$
c. $\frac{4\sigma\cos\alpha}{Wd}$
d. $\frac{Wd}{4\sigma\cos\alpha}$

39. Match List I 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 – 2, B – 1, C – 3, D – 4
b. A – 4, B – 3, C – 1, D – 2
c. A – 1, B – 2, C – 3, D – 4
d. A – 3, B – 4, C – 2, D – 1

41. The loss of prestress due to shrinkage of concrete is the product of

a. Modular ratio and percentage of steel
b. Modular of elasticity of concrete and shrinkage of concrete
c. Modulus of elasticity of steel and shrinkage of concrete
d. Modular ratio and modular of elasticity of steel

42. Which one of the following can be a set of velocity components of a two-dimensional flow

a. $u = x + y$ and $v = x^2 + y^2$
b. $u = x + y$ and $v = x – y$
c. $u = xy$ and $v = x/y$
d. $u = x^2 + y^2$ and $v = x^2 – y^2$

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

a. 10, 15, 20, 25
b. 15, 25, 40, 75
c. 20, 25, 30, 40
d. 20, 35, 40, 75

44. A two-dimensional flow is described by velocity components u = 2x and v = -2y. The discharge between points (1, 1)and (2, 2)is equal to

a. 9 units
b. 8 units
c. 7 units
d. 6 units

45. Consider the following statement concerning both the working stress design and ultimate strength design of reinforced concrete.

1. Plane section before bending remains plane after bending
2. The tensile strength of concrete is ignored

Of these statement
a. 1 alone is correct
b. 2 alone is correct
c. Both 1 and 2 are correct
d. Both 1 and 2 are false

46. When a body moves through still water at a constant velocity of 4.5 m/s the velocity of water at 0.8 m ahead of the nose of the body is 3.0 m/s . What will be the difference in pressure between the nose and the point 0.8 m ahead of it.

a. 875 N/m²
b. 1000 N/m²
c. 1125 N/m²
d. 1250 N/m²

47. 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 mm |
| Effective span of beams | 6.0 mm |
| Distance between points of contraflexure is | 3.60 m |

The effective width of flange of the beam is

a. 3000 m
b. 1900 m
c. 1600 m
d. 1500 m

48. For a sleeper density of (n + 5), number of sleepers required for constructing a broad gauge (BG) railway track of length 650 m is

(a) 975
(b) 918
(c) 900
(d) 880

49. Which of the following method of applying water may be used on rolling land ?

a. Boarder flooding
b. Check flooding
c. Furrow flooding
d. Free flooding

50. 'Composite Sleeper Index' is employed to determine

a) Sleeper densjty requirement
b) Number of fixtures required for a certain type of sleeper
c) Durability of sleeper
d) Mechanical strength of wooden sleeper whereby its suitability for use is assesed