

Questions

- A rod of length L and diameter D is subjected to a tensile load P . Which of the following is sufficient to calculate the resulting change in diameter?
 - Young's modulus
 - Shear modulus
 - Poisson's ratio
 - Both Young's modulus and shear modulus
- Match List I with List II and select the correct answer using the codes given below the Lists:

List I	List II
A. Ultimate strength	1. Internal structure
B. Natural strain	2. Change of length per unit Instantaneous length
C. Conventional strain	3. Change of length per unit gauge length
D. Stress	4. Load per unit area

Codes:

	A	B	C	D
(a)	1	2	3	4
(b)	4	3	2	1
(c)	1	3	2	4
(d)	4	2	3	1
- The deflection at the free end of a uniformly loaded cantilever of length 1m is 7.5mm. What is the slope at free end?
 - 0.01 radian
 - 0.015 radian
 - 0.02 radian
 - 0.025 radian
- Resilience is
 - maximum strain energy
 - recoverable strain energy
 - total potential energy
 - shear strain energy
- All the theories of failure gives nearly the same result
 - when one of the principal stresses at a point is large in comparison to other
 - when shear stresses act
 - when both the principal stresses are numerically equal
 - for all situations of stress
- In a cantilever of span ' L ', subjected to a concentrated load of ' W ' acting at a distance of $L/3$ from the free end, the deflection under load will be
 - $WL^3 / 3 EI$
 - $WL^3 / 81 EI$

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- (c) $14 WL^3 / 81 EI$
(d) $8WL^3 / 81 EI$
7. As per IS : 456, side face reinforcement, not less than 0.05% of web area, is provided on each side when the depth of web is not less than
- (a) 300 mm
(b) 400 mm
(c) 500 mm
(d) 750 mm
8. What is the number of plastic hinges which will cause the overall total collapse of a structure?
- (a) One more than the order of static indeterminacy
(b) Equal to order of static indeterminacy
(c) One less than the order of static indeterminacy
(d) Not determinable
9. Consider the following statements
1. The limit state of collapse is defined as the acceptable limit for the stresses in the materials.
 2. Limit state method is one that ensures adequate safety of structure against collapse.
 3. In the limit state design method, actual stresses developed at collapse differ considerably from the theoretical values.
- Which of the above statements is/are correct?
- (a) 1 and 2
(b) 1 and 3
(c) 2 and 3
(d) None
10. Which of the following pairs is not matched correctly?
- | (Cement test) | (Apparatus) |
|-----------------|------------------|
| (a) Fineness | Nurse and Blains |
| (b) Consistency | Vicat |
| (c) Soundness | Le-Chatelier |
| (d) Sp. gravity | Lea and Nurse |
11. Consider the following oxides:
1. Al_2O_3 2. CaO 3. SiO_2
The correct sequence in increasing order of their percentage in an ordinary Portland cement is
- (a) 2, 1, 3
(b) 1, 3, 2
(c) 3, 1, 2
(d) 1, 2, 3
12. The compacting factor test of cement concrete determines its
- (a) strength
(b) porosity
(c) degree of compaction under loads

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(d) workability

13. In a forced vortex

- (a) the fluid velocity is inversely proportional to the radius
- (b) the fluid rotates without any relative velocity
- (c) the rise depends on the specific weight
- (d) the rise is proportional to the cube of angular velocity

14. In a differential manometer a head of 0.6 m of fluid *A* in limb 1 is found to balance a head of 0.3 m of fluid *B* in limb 2. The ratio of specific gravities of *A* to *B* is

- (a) 2
- (b) 0.5
- (c) 0.18
- (d) cannot be determined

15. The centre of pressure of a rectangular plane with height of liquid *h* m from base

- (a) is $h/2$ m from bottom
- (b) is $h/3$ m from top
- (c) is $h/3$ m from bottom
- (d) can be determined only if liquid specific weight is known.

16. The flow rate between stream lines with values ψ_1 and ψ_2 is given by

- (a) $\psi_1 + \psi_2$
- (b) $\psi_1 + C \psi_2$
- (c) $\psi_2 - \psi_1$
- (d) $C \psi_1 + \psi_2$.

17. A path line describes

- (a) the velocity direction at all points on the line
- (b) the path followed by particles in a flow
- (c) the path over a period of times of a single particle that has passed out at a point
- (d) the instantaneous position of all particles that have passed a point.

18. Reynolds number signifies the ratio of

- (a) gravity forces to viscous forces
- (b) inertial forces to viscous forces
- (c) inertia forces to gravity forces
- (d) buoyant forces to inertia forces.

19. The shear stress at the wall of a 16 cm dia pipe in laminar flow is 36 N/m^2 . The shear stress at a radius of 4 cm in N/m^2 is

- (a) 9
- (b) 18
- (c) 6
- (d) 72

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20. The Muller-Bresalu principal in structural analysis is used for
- (a) drawing influence line diagram for any force function
 - (b) superimposition of load effects
 - (c) to write virtual work equation
 - (d) None of these
21. Road roughness is measured using
- (a) Benkelman beam
 - (b) bump integrator
 - (c) dynamic cone penetrometer
 - (d) falling weight deflectometer
22. As per the Indian Standard soil classification system, a sample of silty clay with liquid limit of 40% and plasticity index of 28% is classified as
- (a) CH
 - (b) CI
 - (c) CL
 - (d) CL-ML
23. Two series of compaction tests were performed in the laboratory on an inorganic clayey soil employing two different levels of compaction energy per unit volume of soil. With regard to the above tests, the following two statements are made.
- I. The optimum moisture content is expected to be more for the tests with higher energy.
- II. The maximum dry density is expected to be more for the tests with higher energy.
- The CORRECT option evaluating the above statements is
- (a) Only I is TRUE
 - (b) Only II is TRUE
 - (c) Both I and II are TRUE
 - (d) Neither I nor II is TRUE
24. Group I contains parameters and Group II methods/instruments.
- | Group I | Group II |
|-----------------------------|--------------------|
| P. Streamflow velocity | 1. Anemometer |
| Q. Evapo-transpiration rate | 2. Penman's method |
| R. Infiltration rate | 3. Horton's method |
| S. Wind velocity | 4. Current meter |
- The CORRECT match of Group I with Group II is
- (a) P – 1, Q – 2, R – 3, S – 4
 - (b) P – 4, Q – 3, R – 2, S – 1
 - (c) P – 4, Q – 2, R – 3, S – 1

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(d) P – 1, Q – 3, R – 2, S – 4

25. In its natural condition, a soil sample has a mass of 1.980 kg and a volume of 0.001 m^3 . After being completely dried in an oven, the mass of the sample is 1.800 kg. Specific gravity is 2.7. Unit weight of water is 10 KN/m^3 . The degree of saturation of the soil is:

- (a) 0.65
- (b) 0.70
- (c) 0.54
- (d) 0.61

26. In a diamond riveting for a plate of width ' b ' and rivet dia ' d ' the efficiency of the joint is

- (a) $(b-d)/b$
- (b) $(b-2d)/b$
- (c) $(b-d)/2b$
- (d) $(b-d)/d$

27. At a location of plastic hinge of a deformed structure

- (a) curvature is infinite
- (b) radius of curvature is infinite
- (c) moment is infinite
- (d) flexural stress is infinite

28. A steel plate is 300 mm wide and 10 mm thick. A rivet of nominal diameter of 16 mm is driven into it, what is the net sectional area of the plate

- (a) 2600 mm^2
- (b) 2760 mm^2
- (c) 2830 mm^2
- (d) 2840 mm^2

29. Lateral ties in RC columns are provided to resist

- (a) bending moment
- (b) shear
- (c) buckling of longitudinal steel bars
- (d) both bending moment and shear

30. Partial safety for concrete and steel are 1.5 and 1.15 respectively, because

- (a) concrete is heterogeneous while steel is homogeneous
- (b) the control on the quality of concrete is not as good as that of steel
- (c) concrete is weak in tension
- (d) voids in concrete are 0.5% while those in steel are 0.15%

31. Concordant cable profile is

- (a) a cable profile that produces no support reactions due to pre-stressing

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- (b) a cable profile which is parabolic in nature
- (c) a cable profile which produces no bending moment at the supports of a beam
- (d) a cable profile laid corresponding to axial stress diagram

32. A flownet of a Cofferdam foundation has 6 flow channels and 18 equipotential drops. The head of water lost during seepage is 6 m. If the coefficient of permeability of foundation is $4 \times 10^{-5} \text{ m/min.}$, then the seepage loss per m length of dam will be

- (a) $2.16 \times 10^{-2} \text{ m}^3/\text{day}$
- (b) $6.48 \times 10^{-2} \text{ m}^3/\text{day}$
- (c) $11.52 \times 10^{-2} \text{ m}^3/\text{day}$
- (d) $34.56 \times 10^{-2} \text{ m}^3/\text{day}$

33. Match List I (in situ test) with List II (Measurement) and select the correct answer :

List I

List II

- | | |
|-------------------------|---------------------------------------|
| A. SPT test | 1. Penetration resistance (N value) |
| B. Plate load test | 2. Load settlement data |
| C. Field vaneshear test | 3. Point resistance and skin friction |
| D. CPT test | 4. In situ shear strength |

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

34. The method of orienting a plane table with two inaccessible points is known as

- (a) Intersection
- (b) Resection
- (c) Back sighting
- (d) two-point problem

35. Reciprocating pumps are suitable for

- (a) low discharge and high head
- (b) high discharge and low head
- (c) low discharge and low head
- (d) high discharge and high head

36. At an incubation temperature of 20°C , if initial DO (dissolved oxygen) and final DO values after 5 days' incubation period are 8.5 mg/l and 5.5 mg/l respectively, then the BOD will be

- (a) 50 mg/l
- (b) 150 mg/l
- (c) 250 mg/l

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- (d) 350 mg / l
37. The correct statement of comparison of ultimate BOD, COD, Theoretical oxygen demand (ThOD) and 5-day BOD (BOD_5) is
- (a) $BOD_u > COD > ThOD > BOD_5$
 - (b) $COD > ThOD > BOD_u > BOD_5$
 - (c) $ThOD > COD > BOD_u > BOD_5$
 - (d) $COD > BOD_u > BOD_5 > ThOD$
38. A 6-hour rainstorm with hourly intensities of 7, 18, 25, 17, 11 and 3 mm/hour produced a runoff of 39 mm. Then, the ϕ -index is
- (a) 3 mm/hour
 - (b) 7 mm/hour
 - (c) 8 mm/hour
 - (d) 10 mm/hour
39. The unit-hydrograph theory is based on the assumption of
- (a) nonlinear response and time invariance
 - (b) linear response and nonlinear time variance
 - (c) time invariance and linear response
 - (d) nonlinear response and nonlinear time variance
40. For which one of the following purposes is the double mass curve used?
- (a) Checking on the consistency of precipitation records
 - (b) Prediction of annual precipitation
 - (c) Defining which periods of storm should be analysed to obtain the maximum useful information from storm rainfall records
 - (d) For estimating the capacity of a reservoir
41. A 6 hour storm has 6 cm of rainfall and the resulting runoff was 3 cm. If ϕ - index remains at the same value, which one of the following is the runoff due to 12 cm of rainfall in 9 hours in the catchment?
- (a) 4.5 cm
 - (b) 6.0 cm
 - (c) 7.5 cm
 - (d) 9.0 cm
42. Match List I (Hydrological Terms) with List II (Relationship/Nature of Curve), and select the correct answer:
- List I
- A. Thiessen Polygon
 - B. Mass Curve
 - C. Hyetograph
 - D. DAD curve
- List II
- 1. Average depth of rainfall over an area
 - 2. Relationship of rainfall intensity and time

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3. Relationship of accumulated rainfall and time
4. Relationship of river run-off and time
5. Always a falling curve

A B C D

- (a) 1 3 2 5
- (b) 1 5 3 2
- (c) 4 3 2 5
- (d) 4 5 3 2

43. Match List I (Well Hydraulics Parameters) with List II (Definition) and select the correct answer

List I

- A. Specific yield
- B. Safe yield
- C. Specific capacity
- D. Field capacity

List II

1. Discharge per unit drawdown of well
2. Same as specific retention
3. Measure of water that can be removed by pumping
4. Limit of withdrawal from well without depletion of the aquifer
5. Water-bearing capacity of aquifer

A B C D

- (a) 4 3 2 5
- (b) 3 4 1 2
- (c) 4 3 1 2
- (d) 3 4 2 5

44. The total observed runoff volume during a 4 hour storm with a uniform intensity of 2.8 cm/hr is 25.2×10^6 m³ from a basin of 280 km² area. What is the average infiltration rate for the basin?

- (a) 36 mm/hr
- (b) 48 mm/hr
- (c) 52 mm/hr
- (d) 55 mm/hr

45. For a certain loading condition, a saturated clay layer undergoes 40% consolidation ma period of 178 days. What would be the additional time required for further 20% consolidation to occur?

- (a) 89 days
- (b) 222.5 days
- (c) 329.5 days
- (d) 400.5 days

46. Match List — I with List — II and select the correct answer using the code given below the Lists:

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List—I (Equipment)

- A. Tintometer
- B. Nephelometer
- C. Imhoff cone
- D. Muffle furnace

List—II (Parameter)

- 1. Temperature
- 2. Colour
- 3. Turbidity
- 4. Settleable solids
- 5. Volatile solids

A B C D

- (a) 4 3 1 5
- (b) 2 5 4 3
- (c) 4 5 1 3
- (d) 2 3 4 5

47. What is the minimum length of a transition curve for a design speed of 80 kmph in a horizontal curve of 240 m radius?

- (a) 32 m
- (b) 42 m
- (c) 52 m
- (d) 72 m

48. The whole circle bearings of lines AB and BC are $30^{\circ} 15'$ and $120^{\circ} 30'$. What is the included angle ABC between the lines AB and BC?

- (a) $229^{\circ} 45'$
- (b) $89^{\circ} 45'$
- (c) $269^{\circ} 45'$
- (d) $90^{\circ} 15'$

49. What is the value of “off tracking” while a vehicle is negotiating a curve of radius 40m with a wheel base of 7.0 m?

- (a) 0.75 m
- (b) 0.69 m
- (c) 0.61 m
- (d) 0.52 m

50. What is the super elevation for a horizontal highway curve designed for a speed of 100 kmph and radius 500 m in mixed traffic conditions?

- (a) 8.9%
- (b) 6.2%
- (c) 0
- (d) 7%

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51. Fresh sludge has moisture content of 99% and, after thickening its moisture content is reduced to 96%. The reduction in volume of the sludge is

- (a) 3%
- (b) 5%
- (c) 75%
- (d) 97.5%

52. Self cleansing velocity is:

- (a) the minimum velocity of flow required to maintain a certain amount of solids in the flow
- (b) the maximum velocity of flow required to maintain a certain amount of solids in the flow
- (c) such flow velocity as would be sufficient to flush out any deposited solids in the sewer
- (d) such flow velocity as would be sufficient to ensure that sewage does not remain in the sewer

53. The losses in prestress in pre-tensioning system are due to

- 1. elastic deformation of concrete when wires are tensioned successively
- 2. friction
- 3. shrinkage and creep of concrete

Select the correct answer using the codes given below:

- (a) 1, 2 and 3
- (b) 2 and 3
- (c) 1 alone
- (d) 3 alone

54. Consider the following statements:

Low percentage of C_3S and high percentage of C_2S in cement will result in

- 1. Higher ultimate strength with less heat generation
- 2. Rapid - hardening
- 3. Better resistance to chemical attack

Which of the statements given above are correct?

- (a) 1 and 2
- (b) 2 and 3
- (c) 1 and 3
- (d) 1,2 and 3

55. Consider the following statements about the characteristics of contours:

- 1. Closed contour lines with higher values inside show a lake.
- 2. Contour is an imaginary line joining points of equal elevations.
- 3. Closely spaced contours indicate steep slope.
- 4. Contour lines can cross each other in case an overhanging cliff.

Which of the statements given above are correct?

- (a) 2, 3 and 4
- (b) 1 and 2 only

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- (c) 1 and 4
- (d) 1,2 and 3

56. Match List — I with List — II and select the correct answer using the code given below the Lists:

List-I

- A. Adjustment of surveying instruments
- B. Bowditch rule
- C. Triangulation
- D. Bessel's method

List-II

1. Bringing the various fixed parts of the instruments into proper relations with one another
2. Solution of three point problem
3. Measuring all the angles and base line
4. Balancing the latitudes and departures

A B C D

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

57. Match List I (Treatment units) with List II (Types of processes) and select the correct answer:

List I

- A. Trickling filter
- B. Activated sludge process
- C. Oxidation ditch
- D. Oxidation pond

List II

1. Symbiotic
2. Extended aeration
3. Suspended growth
4. Attached growth

A B C D

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

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

List I

- A. Flow development
- B. Pipe network
- C. Water hammer
- D. Friction loss

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List II

1. Surge tank
2. Entrance length
3. Darcy-Weisbach equation
4. Hardy-Cross method

A B C D

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

59. Sewage sickness signifies:

- (a) diseases caused by sewage
- (b) soil pores getting dogged and preventing free circulation of air when sewage is continuously applied on land
- (c) raw sewage is applied and used for irrigating vegetables which are eaten raw
- (d) disposal of septic sewage on land

60. Leaching is a process

- (a) by which alkali salts present in the soil are dissolved and drained away
- (b) by which alkali salts in soil come up with water
- (c) of draining excess water of irrigation
- (d) which controls water logging

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1. d 2. a 3. a 4. b
5. a 6. d 7. d 8. a
9. a 10. d 11. b 12. d
13. b 14. b 15. c 16. c
17. c 18. b 19. a 20. a
21. b 22. b 23. b 24. c
25. c 26. a 27. b 28. c
29. c 30. a 31. a 32. c
33. a 34. b 35. a 36. c
37. c 38. c 39. c 40. a
41. c 42. a 43. b 44. d
45. d 46. d 47. d 48. b
49. c 50. d 51. c 52. d
53. d 54. c 55. a 56. c
57. d 58. a 59. b 60. b