

CIVIL ENGINEERING**(PAPER-II)**

1. The type of jump that forms when initial Froude number lies between 2.5 and 4.5 is
 - a. Weak jump
 - b. Steady jump
 - c. undular jump
 - d. oscillating jump
2. During the consolidation of a clay layer, if instead of double drainage, the drainage is allowed at single face only, the rate of compression will be
 - a. 4 times slower
 - b. 4 times faster
 - c. 2 times slower
 - d. 2 times faster
3. For a proposed building, raft foundation, isolated footings and combined footings are being considered. These foundations are to be listed in the decreasing order of preference in terms of performance. Which one of the following is the correct order of listing?
 - a. Raft foundation – combined footings – isolated footings
 - b. Isolated footings – Raft foundation – combined footings
 - c. Combined footings – Raft foundation – isolated footings
 - d. Combined footings – isolated footings – raft foundation
4. Consider the following statements: foundation design in expansive soil can be done by
 1. Isolating the foundation from the swelling soil
 2. Taking measures to prevent the swelling
 3. Employing measures to make the structure withstand the moment.
 Which of the above statements are correct?
 - a. 1 and 2 only
 - b. 2 and 3 only
 - c. 1 and 3 only
 - d. 1, 2 and 3
5. Which one of the following is carried out by two the dilate method?
 - a. Circular curve ranging
 - b. Tachometric survey
 - c. Geodetic survey
 - d. Astronomical survey
6. Electronic theodolites of various ranges in which measured angles are displayed originally on display board area based on which one of the following?
 - a. Special optical technology
 - b. Introduction of microprocessor technology
 - c. Electro-optical technology
 - d. Special gearing
7. If the weight of an angle A ($= 40^\circ 24' 24''$ say) is 2, then the weight of the angle A/3 ($= 13^\circ 28' 08''$) will be
 - a. 4
 - b. $\pm\sqrt{3}$
 - c. 9
 - d. 18
8. Flamsteed gave numbers to stars observed by him in each constellation according to their
 - a. Brilliance
 - b. Altitudes
 - c. Co-declinations
 - d. Right ascensions
9. If δ is the declination of a star and is the latitude of the place of observation, then for a circumpolar star
 - a. $\delta \leq \phi$
 - b. $\delta \geq \phi$
 - c. $\delta \leq (90^\circ - 2\phi)$
 - d. $\delta \leq (90^\circ - 2\phi)$
10. Which one of the following surveys employs alidade?
 - a. Circular curve ranging
 - b. Tachometric survey
 - c. Geodetic survey
 - d. Astronomical survey

- a. Contour survey
b. Archeological survey
c. Plane table survey
d. Reconnaissance survey
11. A particular runway measures 6 cm on a vertical photograph, whereas the same runway measures 4 cm on a map plotted on a scale of 1/24000. The scale of the photograph at the runway elevation is :
a. 1/36000
b. 1/24000
c. 1/36000
d. 1/16000
12. **Assertion (A):** Rankine's earth pressure theory should not be used for concrete retaining walls and coulomb's theory should not be used for estimating passive earth pressures.
Reasons (R): Rankine assumed that the retaining wall has a vertical back and coulomb assumed that the resultant reaction due to earth pressure acts at one-third the height of the wall.
a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is the correct expiation of A
c. A is true but R is false
d. A is false but R is true
13. **Assertion (A):** generally driven piles are adopted in granular soils and not in clays.
Reason (R): Vibratory loading helps in densification of sands but it has adverse effects in clays.
a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is the correct expiation of A
c. A is true but R is false
d. A is false but R is true
14. **Assertion (A):** Under-reamed piles are suitable for loose filled up sites and black-cotton soils.
Reasons (R): Black cotton soil have expansive montmorillonite clay minerals.
a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is the correct expiation of A
c. A is true but R is false
d. A is false but R is true
15. **Assertion (A):** foundation on expansive soils must be designed for as high a bearing pressure as possible consistent with bearing capacity and settlement requirement.
Reasons (R) : Lightly loaded single and two strayed buildings experience maximum damage when built on expansive soils.
a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is the correct expiation of A
c. A is true but R is false
d. A is false but R is true
16. **Assertion (A):** Triangulation networks are to be formed by well conditioned triangles.
Reason (R): triangulation signals should be conspicuous and centered accurately over the stations.
a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is the correct expiation of A
c. A is true but R is false
d. A is false but R is true
17. **Assertion (A):** Road camber helps in surface drainage.
Reason (R): In a curved road alignment, super elevation serves the purpose of camber.
a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is the correct expiation of A
c. A is true but R is false
d. A is false but R is true
18. **Assertion (A):** California bearing ratio test is carried out to evaluate the stability of soil sub grade and other flexible pavement materials over stressed.
Reason: It is essential at no time are the soil sub grade as well as other flexible pavement materials over stressed.
a. Both A and R are individually true and R is the correct explanation of A

- b. Both A and R are individually true but R is the correct explanation of A
 c. A is true but R is false
 d. A is false but R is true
19. **Assertion (A):** wind rose diagrams, showing wind direction duration and intensity are an essential requirement for planning the best direction of main runway of the airport.
Reason (R): corrections for elevation, temperature and gradient have to be applied to determine the length of the main runway of an airport, as per ICAO recommendations.
 a. Both A and R are individually true and R is the correct explanation of A
 b. Both A and R are individually true but R is the correct explanation of A
 c. A is true but R is false
 d. A is false but R is true
20. **Assertion (A):** runway capacity will be more in airport operating under VFR than IFR.
Reason (R): VFR gives more clear visual reference of airport during good weather conditions.
 a. Both A and R are individually true and R is the correct explanation of A
 b. Both A and R are individually true but R is the correct explanation of A
 c. A is true but R is false
 d. A is false but R is true
21. Which of the following statements is/are correct?
 Lining of irrigation canals has necessarily to be carried out in the reaches where the channel passes through
 1. Sandy soil
 2. Coarse aggregate soil
 3. Clay soil
 4. Fine silt and clay
 Select the correct answer using the code given below:
 a. 1 and 3
 b. 3 only
 c. 1 and 2
 d. 3 and 4
22. A 4 hr storm had 4 cm of rainfall and the resulting direct runoff was 20 cm. if the ϕ -index remains at the same value, the runoff due to 10 cm of rainfall in 8 hrs in the catchment is:
 a. 6.0 cm
 b. 7.5 cm
 c. 2.3 cm
 d. 2.8 cm
23. While using darcy-weisbach equation for estimating head loss in a pipe flow the friction factor was misjudged by +20%. For this case, the error in estimating discharge is:
 a. + 10%
 b. + 40%
 c. - 40%
 d. - 10%
24. Consider the following statements:
 Due to aging of pipes in a pipe network
 1. The roughness increases linearly with time
 2. The pipes get rusted and bent.
 3. The pipes become smoother with time.
 Which of the statements given above is/are correct?
 a. 1 and 3
 b. 2 and 3
 c. 3 only
 d. 1 only
25. The shape number in the case of pumps refers to which one of the following?
 a. Ratio of sizes of suction pipe and delivery pipe
 b. Ratio of diameter and thickness of impeller
 c. Non dimensional form of specific speed
 d. Ratio of blade angle at the inlet to the blade angle at the exit
26. Consider the following statements:
 1. Hydraulically most efficient channel section for an open channel flow will carry maximum discharge for a given area of cross section.
 2. For a given cross sectional area hydraulic radius maximum when the wetted perimeter is minimum.
 Which of the statements given above is/are correct?

- a. 1 only
- b. 2 only
- c. Both 1 and 2
- d. Neither 1 nor 2

27. Consider the following statements:

- 1. Fluids of low viscosity are all irrigational.
- 2. Rotation of the fluid is always associated with shear stress.

Which of the statements given above is/are correct?

- a. 1 only
- b. 2 only
- c. Both 1 and 2
- d. Neither 1 nor 2

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

List I

(component)

- A. Taxiways
- B. Control tower
- C. Hanger
- D. Apron

List II

(Design Feature)

- 1. Large span structure
- 2. Visibility all round and sound-proof
- 3. Turning radius
- 4. Waiting capacity for aircraft

Code:

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

29. The size of hangar in an airport is guided by which of the following?

- a. Speed and direction of wind and visibility
- b. Weight of aircraft and turning needs
- c. The fuelling capacity and storage space
- d. The length, wingspan and height of aircraft

30. The orientation of runway is decided by which factors?

- 1. Maximum wind coverage and least cross winds
- 2. Landing characteristics of aircrafts
- 3. Scope for future expansion
- 4. Obstruction-free approaches

Select the correct answer using the code given below:

- a. 1 and 2 only
- b. 1,2 and 3
- c. 1,2 and 4
- d. 2,3 and 4

31. Mean sea level at Indian ports and harbours has generally been established based on the analysis of tidal sea water level fluctuations over which period?

- a. 10 years
- b. 16 years
- c. 19 years
- d. 25 years

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

List -I

(Component)

- A. Keel and Bilge blocks
- B. Capstons and Bolards
- C. Fenders
- D. Apron

List II

(Function)

- 1. Impact absorbers of quay walls
- 2. Floating indicators
- 3. Supports for ships in dry docks
- 4. Anchorage devices for ships

Code:

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

33. Echo-sounding machine is used for which of the following?

- 1. Locating objects on sea shore
- 2. Measuring sea-surface levels
- 3. Determining depth of sea-bed below sea surface

4. Location sunken objects below sea surface

Select the correct answer using the code given below:

- a. 1 and 3 only
- b. 1, 2 and 3
- c. 2 and 4
- d. 3 and 4

34. Which of the following pairs are correctly matched?

- 1. Vishakhapatnam - Plymouth : Semi-natural harbor
- 2. Para dip and Mangalore: Lagoon harbor
- 3. New York : Natural harbor

Select the correct answer using the code given below

- a. 1 and 2 only
- b. 2 and 3 only
- c. 1 and 3 only
- d. 1, 2 and 3

35. Consider the following statements:

- 1. Piles are provided in groups, which are connected together by a pile cap. The structure rests on top of the pile cap. The pile cap is situated below the ground level.
- 2. For situations where pile is subjected to upward pull, pedestal piles or under-reamed piles are more suitable type of foundations.

Which of the statements given above is/are correct?

- a. 1 only
- b. 2 only
- c. Both 1 and 2
- d. Neither 1 nor 2

36. In comparison to Atterberg limits of normal soil, the expansive soils have which of the following?

- 1. More liquid limit
- 2. Less plastic limit
- 3. Less shrinkage limit
- 4. More volumetric shrinkage

Select the correct answer using the code given below:

- a. 1, 2, 3 and 4
- b. 1, 3 and 4 only

- c. 2 and 3 only
- d. 1, 2 and 4 only

37. Consider the following statements:

On addition of lime to swelling soils,

- 1. Their liquid limit increases
- 2. Their plastic limit increases
- 3. Their shrinkage limit increases
- 4. Their swelling potential decreases

Which of the statements given above are correct?

- a. 1 and 3 only
- b. 1, 2 and 4 only
- c. 2, 3 and 4 only
- d. 1, 2, 3 and 4

38. Consider the following statements about the under-reamed pile in swelling soils:

- 1. Its bulb provides anchor against movement due to volume changes of soil.
- 2. It is a driven pile.
- 3. Its bulb diameter is 2-5 times its shaft diameter.

Which of the statements given above are correct?

- a. 1, 2 and 3
- b. 1 and 2 only
- c. 2 and 3 only
- d. 1 and 3 only

39. A scale of 1 inch = 50 ft. is mentioned on an old map. What is the corresponding equivalent scale?

- a. 1 cm = 5 m
- b. 1 cm = 6 m
- c. 1 cm = 10 m
- d. 1 cm = 12 m

40. 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. $90^\circ 15'$

41. What is $\angle ABC$ if FB of line AB is 40° and BB of line BC is 280° ?

- a. 90°
- b. 120°

- c. 240°
d. 320°
42. Which one of the following statements is not correct?
- Change point is a point denoting shifting of level
 - For leveling work both centering and leveling of a dumpy level are prerequisite
 - Bench mark is a point whose R.L. is always known
 - None of the above

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

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

Which of the statements given above are correct?

- 2, 3 and 4
 - 1 and 2 only
 - 1 and 4
 - 1, 2 and 3
44. Which of the following can be used as a map substitute?
- Terrestrial photographs
 - Vertical aerial photographs
 - Oblique aerial photographs
 - Vertical aerial photo-mosaics

45. Match List-I with List-II and select the correct answer using the code given below the list

List-I

- Visual interpretation
- Geographical information system
- National remote sensing agency
- Supervised image classification

List-II

- Creation of data bank of multi information for a project area
- Visual identification of objects from image characteristics

- Computer classification of digital image data

- Supplier of aerial and satellite based remote sensing data products in India

Code:

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

46. Which one of the following is not strictly a method of remote sensing?

- Thermal and multi spectral scanning
- Microwave sensing
- Earth resource satellite
- Stereoscopy

47. Consider the following bituminous surfacing:

- SDBM
- PMC
- A.C.
- S.D.
- Mastic asphalt (M.A.)

Which one of the following is the correct sequence in increasing order with respect to their performance and wearing qualities?

- 4, 1, 2, 3, 5
- 2, 4, 1, 5, 3
- 4, 2, 1, 3, 5
- 1, 4, 3, 2, 5

48. Consider the following statements with reference to water bound macadam (WBM) and wet mix macadam (WMM):

- WBM is a road mix and WMM is a plant mix.
- WBM usually has plastic filler, while WBM has non-plastic filler.
- WBM is a modern road mix and WMM is a traditional road mix.

Which of the statements given above is/are correct?

- 1 and 2
- 2 and 3
- 1 only
- 2 only

49. A line load of infinite length has an intensity q per unit length. What is the vertical stress σ_z at a depth z below the earth at the centre of the load?

a. $\sigma_z = \frac{2qz}{\pi}$
 b. $\sigma_z = \frac{2q}{\pi z}$
 c. $\sigma_z = \frac{2qz^2}{\pi}$
 d. $\sigma_z = \frac{2q}{\pi z^2}$

50. IRC code No. 37-1985 deals with which one of the following?

- a. Design of rigid pavements, taking ESWL and CBR into account
 b. Design of rigid pavements, taking axle load and CBR into account
 c. Design of flexible pavement, taking ESWL and CBR into account
 d. Design of flexible pavement taking cumulative axle loads and CBR into account.

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

List I

- A. Traffic volume
 B. Traffic density
 C. Traffic Regulations
 D. Rotary Intersection

List II

1. Number of vehicles occupying a unit length of road at a given instant of time.
 2. Number of vehicles passing a given point on road in a given unit of time in a given direction
 3. Where all converging vehicles are forced to move in one direction around a large central traffic island
 4. Rules covering all aspects of control of vehicles, drivers and all other road users

Code:

	A	B	C	D
a.	2	4	1	3
b.	3	1	4	2

- c. 2 1 4 3
 d. 3 4 1 2

52. Which of the following factors are not strictly related to design of traffic rotary intersections?

1. Radius of central island
 2. Weaving length
 3. Ramps and interchanges
 4. Acceleration lanes

Select the correct answer using the code given below:

- a. 1 and 2
 b. 1 and 4
 c. 2 and 3
 d. 3 and 4

53. A pressure gauge reads 57.4k pa and 80k pa respectively at heights of 8m and 5m fitted on the side of a tank filled with liquid. What is the approximate density of the liquid in kg/m^3 ?

- a. 393
 b. 768
 c. 1179
 d. 7530

54. What is the momentum thickness for the boundary layer with velocity distribution

$$\frac{u}{U} = \frac{y}{\delta}^2$$

- a. $\delta/6$
 b. $\delta/2$
 c. $3\delta/2$
 d. 2δ

55. In model similarity, if gravitational and inertial forces are the only important forces, then what is the discharge ratio?

- a. $L_r^{3/2}$
 b. $L_r^{1/2}$
 c. $L_r^{5/2}$
 d. L_r^{10}

Where L_r = ratio of length dimension.

56. When discussing most efficient section of flow into open channels, what is the perimeter P as a proportion of depth of flow h (ie., P/h) for (i) a triangular section, and (ii) a trapezoidal section, respectively?

- a. 2.25, 2.83
 b. 2.25, 3.15

- c. 2.83, 3.15
d. 2.83, 3.46
57. What is the energy loss through a length of pipe from which all the discharge is taken out uniformly along its length, with respect to the case when all the discharge is delivered to the end?

a. $2/3$
b. $1/3$
c. $3/2$
d. $1/2$

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

List I

(Principle)

- A. Hele Shaw flow
B. Stokes law
C. Hagen-Poiseuille flow
D. Pascal's law

List II

(Effect)

1. Surface of equal pressure
2. Settling of fine particles
3. Laminar flow between parallel plates
4. Laminar flow in tubes

Code:

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

59. A fast centrifugal pump impeller has which of the following?

- a. Forward facing blades
b. Radial blades
c. Backward facing blades
d. Propeller type blades

60. Consider the following statements:

An air vessel is fitted on the suction side of a reciprocating pump to

1. Achieve higher speed without separation
2. Reduce work in overcoming frictional resistance
3. Avoid excessive vibration

4. Have uniform discharge

Which of the statements given above are correct?

- a. 1, 2 and 4
b. 1 and 2 only
c. 3 and 4 only
d. 2, 3 and 4

61. Water is supplied from a height of 2.8 m at the rate of 35 lps to a hydraulic ram which delivers 2 lps to a height of 28 m above the ram. What is the Rankine's efficiency?

- a. 58%
b. 55%
c. 52%
d. 44%

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

List I

(Type of Power House)

- A. Tidal Plant
B. Storage Plant
C. Pumped Stored Plant
D. Run-of-river Plant

List II

(Feature)

1. Utilizes reversible turbines and improves utilization factor
2. Utilizes current flow in stream, and has pond age to improve load factor
3. Utilizes current flow in stream, and has pond age to improve load factor
4. Utilizes annually average flow with storage

Code

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

63. Kilpich equation is used to determine which one of the following?

- a. Run-off from a given rainfall
b. Base time of a unit hydrograph
c. Time of concentration in run-off hydrograph
d. None of the above

64. Form the analysis of rainfall data at a particular station, it was found that a rainfall of 400 mm had a return period of 20 years.
- $(0.95)^{10}$
 - $1-(0.95)^{10}$
 - $1-(0.05)^{10}$
 - $(0.05)^{10}$
65. Inconsistency of rainfall data can be checked by which one of the following?
- Normal ratio method
 - Mass curve method
 - Double-mass curve method
 - Depth duration frequency curve
66. What is the chemical symbol for ice as per UNESCO terminology?
- H_8O_4
 - H_2O
 - H_6O_3
 - H_4O_2
67. What is the depth of water seal in the traps?
- < 2.5 cm
 - 2.5 – 7.5 cm
 - 7.5 – 12.5 cm
 - Not less than 15 cm
68. Bangalore and Indore process of composting are which of the following?
- Both anaerobic processes
 - Both aerobic processes
 - Anaerobic process and aerobic process, respectively
 - Aerobic process and anaerobic process, respectively
69. A solid waste sample has been segregated and one of the components has been subjected to elemental analysis. The result of analysis in percent by mass revealed C (40%), H (6.0%), O (44%), N (0.3%). What is the likely waste component?
- Food waste
 - Paper and cardboard waste
 - Plastic waste
 - Leather waste
70. Pneumoconiosis is caused due to inhalation of which one of the following?
- Silica
 - NO_x
 - Lead
 - Cadmium
71. Which one of the following conditions of automobile gives maximum unburned hydrocarbons?
- Idling
 - Cruise
 - Acceleration
 - Deceleration
72. Electrostatic precipitator is most useful for which one of the following industries?
- Tannery
 - Hydroelectric power generation
 - Thermal power generation
 - Textile factory
73. What will be the resultant decibel level when two sources make noise of equal decibels?
- Decibel level will be the same
 - Decibel level will increase by 3 decibels
 - Decibel level will decrease by 3 decibel
 - Decibels of the two sources
74. Match List –I with List-II and select the correct answer using the code given below the lists:
- List I
(Air pollutant)
- CO
 - CO_2
 - SO_2
 - NO_x
- List II
(Effect)
- Acid rain
 - Acute toxicity
 - Ozone liberation
 - Greenhouse effect
- Code
- | | A | B | C | D |
|----|---|---|---|---|
| a. | 4 | 3 | 1 | 2 |
| b. | 4 | 3 | 2 | 1 |
| c. | 2 | 4 | 1 | 3 |
| d. | 3 | 4 | 1 | 2 |

75. Biological magnification of pesticides takes place through which of the following?

- Population pyramids
- Hydrologic cycle
- Food chains
- Air cycle

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

List I

(Soil Classification Symbol)

- GW
- SW
- ML
- CL

List II

(Soil Property)

- Soil having uniformity coefficient > 6
- Soil having uniformity coefficient > 4
- Soil having low plasticity
- Soil having low compressibility

Code:

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

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

List-I

(Soil)

- Fine sand
- Silt
- Peat

List II

(Type)

- Expansive soil
- Coarse grained soil
- Fine grained soil
- Organic soil

Code:

	A	B	C
a.	3	2	1
b.	4	3	1

- 3 1 2
- 2 3 4

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

List-I

(Symbol)

- ML
- SM
- Pt
- MH

List II

(Soil)

- Silty sand
- Inorganic silt with large compressibility
- Inorganic silt with small compressibility
- Soil with high organic content with high compressibility

Code:

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

79. Maximum possible discharge from a small catchment corresponding to a particular rainfall intensity is independent of which one of the following?

- Soil moisture conditions
- Drainage characteristics of catchment
- Area of the catchment
- Duration of the rainstorm

80. The permissible tractive force in an erodible channel depends upon which of the following?

- Angle of repose of the material
- Particle size
- Sediment content of water
- Wetted perimeter of channel

Select the correct answer using the code given below:

- 1, 2 and 4
- 1, 2 and 3
- 1 and 3 only
- 2 and 4 only

81. Which one of the following is correct?
Semi-module outlets are those outlets in which

- a. Discharge gets affected by the change in water level of field channel
- b. Discharge gets affected by the change in water level of the distributing channel but not with the change in water level of field channel
- c. Discharge is independent of water levels in the distributing channel and the field channel
- d. None of the above

82. For calculating the maximum flood discharge in an alluvial stream, which is the best suited relation?

- a. $v \propto R^{2/3} S^{1/3}$
- b. $v \propto R^{2/3} S^{1/2}$
- c. $v \propto R^{1/2} S^{1/2}$
- d. $v \propto D^{0.64}$

83. For water supply to a medium town, what is the daily variation factor?

- a. 1.5
- b. 2.5
- c. 3
- d. 3.5

84. Which one of the following factors has the maximum effect on figure of per capita demand of water supply of a given town?

- a. Method of charging of the consumption
- b. Quality of water
- c. System of supply-intermittent or continuous
- d. Industrial demand

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

List I

(Predominance of Compounds)

- A. Monochloramine
- B. Dichloramine
- C. Nitrogen trichloride

List II

(pH range)

- 1. Below pH 4.4
- 2. Over pH 7.5

3. Between pH 5 to 6.5

Code:

	A	B	C
a.	1	2	3
b.	2	3	1
c.	3	1	2
d.	3	2	1

86. Which of the following are the advantages of cast-iron pipe for its use in water supply?

- 1. Resistant to corrosion to a reasonable extent
- 2. Very easy to join the pipes
- 3. Easy to transport
- 4. Longer life

Select the correct answer using the code given below:

- a. 1, 3 and 4
- b. 1, 2 and 3
- c. 1 and 4 only
- d. 2, 3 and 4

87. Which one of the following valves is seldom used in water distribution systems because of high head loss characteristics?

- a. Butterfly
- b. Globe
- c. Plug
- d. Sluice

88. Son scope is used for which one of the following?

- a. Checking the accuracy of water meters
- b. Regulating the fire hydrants
- c. As a replacement of venturimeter for discharge measurement
- d. Detection of leakage in underground water mains

89. In the design consideration of sewerage system, the sewers must have which one of the following?

- a. Maximum velocity of flow
- b. Only 50 percent of maximum velocity of flow
- c. Minimum velocity of not less than cleansing velocity of flow
- d. High pressure at all times

90. Which one of the following is considered as the thermophilic range of sludge digestion?
- 60°C to 70°C
 - 50°C to 57°C
 - 29°C to 40°C
 - 20°C to 30°C
91. Consider the following statements:
In context of sludge volume index (SVI),
- The SVI is expressed as the volume (in cu. Cm) of the activated sludge for one gram of dry weight of the sludge.
 - A higher value of SVI indicates a light and fluffy sludge which is not easily settle able.
- Which of the statements given above is/are correct?
- 1 only
 - 2 only
 - Both 1 and 2
 - Neither 1 nor 2
92. Which one of the following can fix atmospheric nitrogen?
- Green algae
 - Blue green algae
 - Red algae
 - Brown algae
93. An industry has a sewage treatment plant which produces sludge with a moisture content of 98%. With the solid content remaining the same, the sludge is thickened so that the moisture content now is 96%. If the original quantity of sludge is P, what is the quantity of the quantity of the thickened sludge?
- 0.98 P
 - 3 P/4
 - 2 P/3
 - P/2
94. a well operating activated sludge process unit, what is the value of sludge volume index?
- < 50
 - 100-150
 - 200-300
 - >300
95. What does the presence of excess nitrates in river water indicate?
- Recent pollution of water with sewage
 - Past pollution of water with sewage
 - Intermittent pollution of water with sewage
 - No pollution of water with sewage
96. What is the minimum turning radius for a passenger ship?
- 2 × ship length
 - 3 × ship length
 - (1.5 × ship length) + water depth
 - (2 × ship length) + (1.5 × draft)
97. Match List –I with List-II and select the correct answer using the code given below the lists:
- List I
(Harbour Structure)
- Dolphins
 - Groynes
 - Fenders
 - Slipways
- List II
(Purpose)
- To protect the beach or retained earth
 - To cushion to absorb shock of ship during loading the unloading
 - Mooring structure in combination with loading platform
 - Repairing and building ship
- Code:
- | | A | B | C | D |
|----|---|---|---|---|
| a. | 2 | 4 | 3 | 1 |
| b. | 3 | 1 | 2 | 4 |
| c. | 2 | 1 | 3 | 4 |
| d. | 3 | 4 | 2 | 1 |
98. Which of the following are related to maintenance of railway track?
- Jim crow and gauge bar
 - Through packing and boxing
 - Buffer stop and sand hump
 - Creep adjustment
- Select the correct answer using the code given below:
- 1, 2 and 3
 - 1, 3 and 4
 - 1, 2 and 4

- d. 2, 3 and 4
99. The vertical water on tongue rail should not exceed which one of the following?
- 6 mm
 - 10 mm
 - 12 mm
 - 15 mm
100. What is the hauling capacity of a railway locomotive having 4 pairs of driving wheels, carrying an axle load of 24 tonnes each? (Assume 0.166 as the coefficient of friction)
- 16.5 tonnes
 - 16.0 tonnes
 - 15.5 tonnes
 - 17.0 tonnes
101. Which of the following factors help in ensuring track modulus, in a railway track?
- Gauge and formation width
 - Track materials and sleeper density
 - Degree of curvature and super elevation
 - Length of rail and flange width
102. The 'track modulus' is an index of measure of which of the following?
- Resistance due to friction
 - Resistance due to shear
 - Resistance due to deformation
 - Resistance due to rolling
103. How can additional access, quick removal of muck and natural ventilation in long tunnels be achieved?
- By providing jumbos and pumps
 - By providing scaffolding and liner plates
 - By providing adits and shafts
 - By providing pilot tunnels and well points
104. Weishbach triangle method may be used for which one of the following?
- To carry out surface alignment of a tunnel
 - To transfer levels underground tunnel surveys
 - To connect two ends of an underground tunnel surveys
 - To connect two ends of an underground tunnel
105. Which one of the following methods of tunneling is employed if the strata is sub-aqueous?
- Shield tunneling
 - Drift system
 - Liner plate method
 - Pilot tunnel method
106. In modal choice studies which one of the following factors influences the shape of diversion curves?
- Trip purpose
 - Trip length
 - Income
 - Residential density
107. In urban transportation planning, the modal split' is the process of which one of the following?
- Staggering of working hours
 - Segregation of fast and slow modes
 - Separation of traffic streams by flyovers
 - Deciding the choice for a mode
108. Which one of the following is correct? In laboratory compaction tests, the optimum moisture content of soil decreases
- With increase of compaction energy and with decrease of coarse grains in the soil
 - With decrease of compaction energy and with increase of coarse grains in the soil
 - With increase of both compaction energy and coarse grains in the soil
 - With decrease of both compaction energy and coarse grains in the soil
109. Consider the following statements:
- Coefficient of consolidation normally increases with decreasing liquid limit of clay.
 - The larger the value of coefficient of consolidation, the longer it takes for full consolidation to occur.
- Which of the statements given above is/are correct?
- 1 only
 - 2 only

- c. Both 1 and 2
d. Neither 1 nor 2

110. Consider the following statements:

1. Pore pressure parameter a is a constant for a soil.
2. The shear strength of soil is a function of the effective stress in the soil and not of the total stress in the soil.

Which of the statements given above is/are correct?

- a. 1 only
b. 2 only
c. Both 1 and 2
d. Neither 1 nor 2

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

List I

(Equipment)

- A. Hydrometer
B. Plate load test set up
C. Pycnometer
D. Direct shear apparatus

List II

(Use)

1. Determination of shear parameter
2. Determination of bearing capacity of specific gravity
3. Determination of bearing capacity of soils
4. Grain size distribution tests for clays

Code:

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

112. A vertical cut is to be made in saturated clay with $C=15 \text{ kN/m}^2$, $\phi = 0$ and $\gamma = 20 \text{ kN/m}^3$. What is the theoretical depth to which the clay can be excavated without side collapse?

- a. 6 m
b. 2 m
c. 2.5 m
d. 3 m

113. In seismic exploration method, velocities V_1 and V_2 were 600 m/s and 4000 m/s the distance corresponding to the break point of velocities was 30 m. based on this detail, what is the depth of overburden?

- a. 11.5 m
b. 12.5 m
c. 12.9 m
d. 13.2 m

114. Consider the following statements in respect of static cone penetration test:

1. The cone used has an apex angle of 60° and base area of 10 cm^2
2. This test gives a continuous record of cone resistance.

Which of the statements given above is/are correct?

- a. 1 only
b. 2 only
c. Both 1 and 2
d. Neither 1 nor 2

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

List-I

(Foundation)

- A. Under-reamed piles
B. Floating rafts
C. Combined footing
D. Strap footing

List II

(Demanding Situation)

1. To restrict settlement of soft clays/silts
2. To transfer the moment in between two adjacent footings
3. To restrict damages due to volume changes of swelling soils
4. When columns are very close to the property line

Code:

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

116. A differential free swell test on a soil gives a value of differential free swell of 40% what is the degree of swelling?

a. Low
b. Medium
c. High
d. Very high

117. Which factors influence the bearing capacity of a purely cohesion less soil?

1. Relative density of soil
2. Width and depth of footing
3. Unit weight of soil

Select the correct answer using the code given below:

a. 1 and 2 only
b. 2 and 3 only
c. 1 and 3 only
d. 1,2 and 3

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

List I

(Field Test)

A. Plate load test
B. Standard penetration test
C. Vane shear test
D. Dilatancy test

List II

(Suitability)

1. To estimate bearing capacity of granular soil
2. To estimate in situ strength of soft clay
3. To identify silt from clay
4. To estimate bearing capacity for permissible settlement, in clays

Code:

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

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

List I

(Test)

A. Field Density test
B. Plate load test
C. C.B.R test

List II

(Utility)

1. Stress deformation characteristics
2. Compaction characteristics
3. Design of pavement
4. Safe load bearing capacity of soil

Code:

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

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

List-I

(Method)

A. Static formulae
B. Dynamic formulae
C. Static pile load test
D. Cyclic pile load test

List-II

(Suitability)

1. To estimate allowable load for permissible settlement for a pile
2. To separate point bearing and friction bearing capacities of a pile
3. To estimate allowable load for driven piles in granular soils
4. To estimate allowable load for board piles in clays

Code:

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