CIVIL ENGINEERING

(PAPER–II)

1. Match list I with list II and select the correct answer

List I

A. Loess
B. Peat
C. Alluvial soil
D. Mari

List II

1. Deposited from suspension in running water
2. Deposits of marine origin
3. Deposits by wind
4. Organic soil

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

2. Match List I (Soils) with List II (Group symbols) and select the correct answer :

List I

A. Clayey gravel
B. Clayey sand
C. Organic clay
D. Silty sand

List II

1. SM
2. OH
3. SC
4. GC

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

3. The value of porosity of a soil sample in which the total volume of soil grains is equal to twice the total volume of voids would be

a. 75%
b. 66.66%
c. 50%
d. 33.33%

4. A soil has a liquid limit of 40% and plasticity index of 20%. The plastic limit of the soil will be

a. 20%
b. 30%
c. 40%
d. 60%

5. In a two-layer soil system, the top soil and bottom soil are of same thickness but the coefficient of permeability of the top soil is twice that of the bottom solid of coefficient of permeability 'k'. When horizontal flow occurs, the equivalent coefficient of permeability of the system will be

a. 2 k
b. 1.5 k
c. 1.25 k
d. 1.2 k

6. A strata of 3.5 m thick fine sand has a void ratio of 0.7 and G of 2.7. For a quicksand condition to develop in this strata, the water flowing in upward direction would require a heat of

a. 7 m
b. 5.56 m
c. 5 m
d. 3.5 m

7. A flownet of a Coffer dam 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 4×10^{-5} m/min., then the seepage loss per m length of dam will be

a. 2.16×10^{-2} m^3 / day
b. 6.48×10^{-2} m^3 / day
c. 11.52×10^{-2} m^3 / day
d. 34.56×10^{-2} m^3 / day

8. A sample of saturated sand has a dry unit weight of 18 kN/m^3 and a specific gravity

of 2.7. If γ_{water} is 10 kN / m^3, the void ratio of the soil sample will be

a. 0.5
b. 0.6
c. 0.4
d. 0.9

9. Consider the following features of direct shear test :

1. Failure takes place on the predetermined plane
2. It is a quick test
3. Drainage conditions cannot be changed
4. Failure of the sample is progressive

Which of these are the disadvantages of direct shear test ?

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

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

List I

A. SPT test
B. Plate load test
C. Field vaneshear test
D. CPT test

List II

1. penetration resistance (N value)
2. Load settlement data
3. Point resistance and skin friction
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

11. The correct sequence of the given parameters in descending order of eat pressure intensity is

a. active, passive, at rest
b. passive, active at rest
c. passive, at rest, active
d. at rest, passive, active

12. Consider the following statements associated with stability of slope :

1. Stability number is inversely proportional to cohesion and directly proportional to height
2. Swedish method of analysis is based on circular failure surfaces.
3. The Culmann method assumes that rupture will occur in a plane

Which of the statement are correct ?

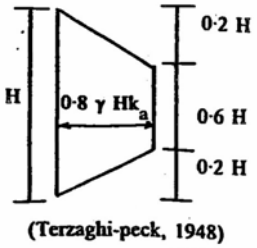
a. 2 and 3
b. 1 and 3
c. 1 and 2
d. 1, 2 and 3

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

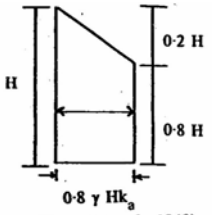
List I

A. Dense sand
B. Loose sand
C. Plastic clay

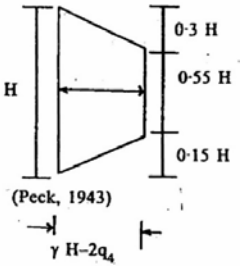
List II

1. 

(Terzaghi-peck, 1948)

2. 

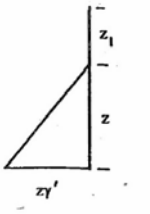
(Terzaghi-peck, 1948)

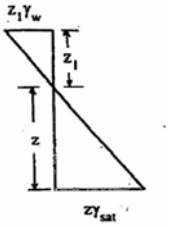
3. 

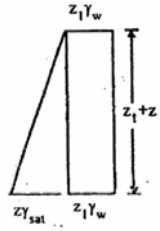
	A	B	C
a.	3	2	1
b.	2	1	3
c.	1	3	2
d.	1	2	3

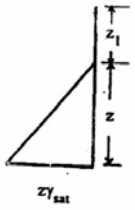
14. Which one of the following diagrams represents the effective pressure distribution for a saturated soil mass of depth z submerged under water of height z_1 above its top level (γ' = submerged

density of soil, γ_{sat} = saturated density of soil and γ_w = unit weight of water) ?

a. 

b. 

c. 

d. 

15. Match List I with List II and select the correct answer using the codes (Notations have their usual meaning) :

List I

A. Coefficient of compressibility
B. Compression index
C. Time factor
D. Coefficient of volume compressibility

List II

1. m_v
2. C_vt/H^2
3. a_v
4. C_c

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

16. Reduction in volume of soil primarily due to squeezing out of water from the voids is called

a. primary consolidation
b. plastic flow
c. creep
d. secondary consolidation

17. In the case of stratified soil layers, the best equation that can be adopted for computing the pressure distribution is

a. Prandtl's
b. Skempton's
c. Westergaard's
d. Boussinesq's

18. A wet, cohesive subgrade is most effectively stabilized by the addition of

a. cement
b. fly ash
c. bitumen
d. lime

19. The settlement analysis for a clay layer draining from top and bottom shows a settlement of 2.5 cm in 4 years and an ultimate settlement of 10 cm. However detailed subsurface investigation reveals that there is no drainage at the bottom. The ultimate settlement in this condition will be

a. 2.5 cm
b. 5 cm
c. 10 cm
d. 20 cm

20. Match List I (Suitable condition) with list II (Foundations) and select the correct answer :

List I

A. When structural load is uniform and soil is soft clay, made up of marshy land
B. When structural load is heavy and/or soil having low bearing capacity for considerable depth
C. When soil is having good bearing capacity at shallow depth and structural load is within permissible limit
D. When structural load of bridge is to be transferred through sandy soil to bed rock

List II

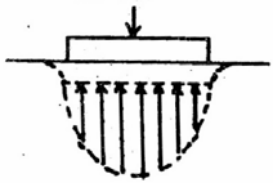
1. Footings
2. Piles
3. Raft

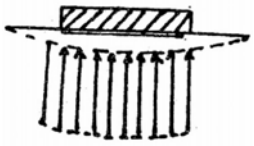
4. Wells or pier

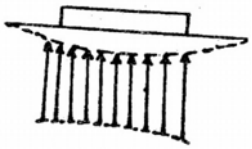
	A	B	C	D
a.	3	1	2	4
b.	4	1	2	3
c.	4	2	1	3
d.	3	2	1	4

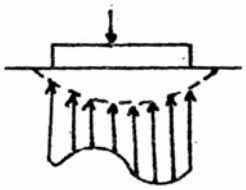
21. Match list I(Contact pressure distribution diagrams) with List II (Description of footings) and select the correct answer :

List I

A. 

B. 

C. 

D. 

List II

1. Rigid footing on cohesive soil
2. Flexible footing on cohesive soil
3. Rigid footing on cohensionless soil at ground level
4. Flexible footing on cohesionless soil at ground level

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

22. Depth of foundation depends upon

a. Scour depth, minimum grip length and Rankine depth
b. Scour depth, minimum grip length and depth of a bearing stratum
c. Scour depth, Rankine depth and depth of a bearing stratum
d. Minimum grip length, Rankine depth and depth of bearing stratum

23. The nature of earth pressure above dredge line behind a cantilever sheet pile wall is

a. active
b. passive
c. at rest
d. active and passive

24. A machine foundation weights 39.24 kN and has a spring constant k = 10000 kN/m. The system will be critically dumped if the damping coefficient 'C_c' is (acceleration due to gravity, g = 9.81 m^2/s.

a. 100 kN.s/m
b. 200 kN.s/m
c. 400 kN.s/m
d. 800 kN.s/m

25. Which one of the following soil types is most likely to be subjected to liquefaction under seismic forces ?

a. Soft saturated clays
b. Loose saturated sands
c. Murum
d. Fractured rocky strata

26. The length of National Highways as per 3rd 10 years (Lucknow) road plan is given by

a. area of the country / 75
b. area of the country / 50
c. area of the country / 40
d. area of the country / 25

27. Total reaction time of a driver does not depend upon

a. perception time
b. brake reaction time
c. condition of mind of the drive
d. speed of vehicle

28. A horizontal curve of 480 m for 7.5 m two-lane road is to be designed for a speed of 80 kmph. The raising of the outer edge of the pavement with respect to the inner edge to cater to the mixed traffic condition is

a. 0.14 m
b. 0.22 m
c. 0.24 m
d. 0.27 m

29. If the modulus of subgrade reaction of a soil is 10kg/cu.cm when tested with a 30 cm diameter plate, the corrected modulus

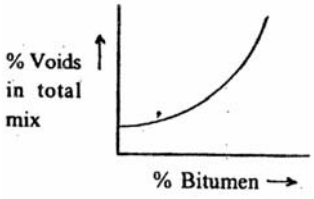
of subgrade reaction for the standard diameter plate will be

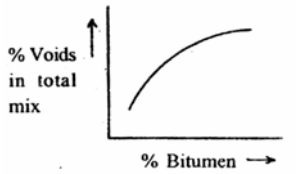
a. 4
b. 15
c. 20
d. 25

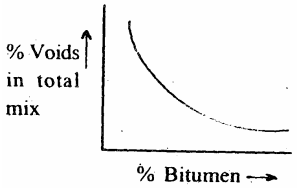
30. Bitumen grade 80/100 indicates that under the standard test conditions, penetration value of bitumen would vary from

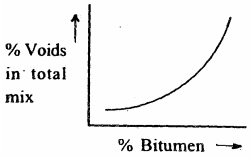
a. 0.8 mm to 1 mm
b. 8 mm to 10 mm
c. 8 cm to 10 cm
d. 0.08 mm to 0.1 mm

31. Which one of the following curves illustrates the correct relation between % voids in total mix and % bitumen ?

a.


b.


c.


d.


32. Consider the following factors :

1. Length of vehicle
2. Width of vehicle
3. Approach speed
4. Stopping time for approaching vehicle
5. Passing sight distance

Which of these factors are taken into consideration for determining yellow time of a traffic signal at an inter-section ?

a. 1, 2 and 5
b. 2, 3 and 4
c. 1, 3 and 5
d. 1, 3 and 4

33. Which one of the following is useful in functional evaluation of pavement ?

a. P C U
b. P S I
c. P I E V
d. Benkelman beam

34. A railway yard in which wagons are received, sorted and new trains are formed is called a

a. good yard
b. station yard
c. marshalling yard
d. shunting yard

35. A cross-over of 1 in 10 exists between two broad gauge parallel tracks with centres at 5 m apart. The length of the straight track is

a. 16.4 m
b. 18.4 m
c. 19.2 m
d. 19.92 m

36. Which one of the following signals is provided beyond the trailing points and switches in a railway yard ?

a. Repeater signal
b. Departure signal
c. Advance starter
d. Routing signal

37. The phenomenon of movement and deposition of san din a zig-zag due to drifting of sand in the vicinity of coast is called

a. littoral drift
b. sedimentation
c. beach drift
d. trough action

38. Match list I(Structure) with List II(Purpose) and select the correct answer :

List I

A. Breakwater
B. Wharf
C. Fender system
D. Revetments

List II

1. Separates the land from sea water
2. Lays vessels alongside, receives and discharges cargo and passengers

3. protects a seashore
4. Absorbs the energy of the moving vessel
5. Retards erosion of an existing beach

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

39. The lowest tide which occurs in half lunar month is called
   a. spring tide
   b. neap tide
   c. lunar tide
   d. tidal bore

40. Which one of the following methods of tunneling is used in hard rock ?
   a. Forepoling method
   b. Needle beam method
   c. Heading and benching method
   d. Shield tunneling method

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

List I

A. P N d B
B. L C N
C. S T O L
D.

List II

1. Noise level
2. Visual range
3. Airport pavement evaluation
4. type of aircraft

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

42. For a runway at an elevation of 1000 m above MSL and airport reference temperature of 16° C, the rise in temperature to be taken into account as per ICAO is
   a. 24.5° C
   b. 15° C
   c. 7.5° C
   d. 6° C

43. Which one of the following surveys is required in observations of stars ?
   a. Astronomical survey
   b. Cadastral survey
   c. Aerial survey
   d. Photogrammetric survey

44. The arithmetical check for the computation of R.L. by "rise and fall" method is given by
   a. Σ F.S. — Σ B.S. = R.L. of last station point — R.L. of first station point = ΣFall — Σ Rise
   b. Σ B.S. — Σ F.S. = R.L. of first station point — R.L. of last station point = ΣRise + Σ Fall
   c. Σ B.S. — Σ F.S. = R.L. of last station point — R.L. of first station point = ΣRise — Σ Fall
   d. Σ B.S. — Σ F.S. = ΣRise — Σ Fall = R.L. of first station point — R.L. of last station point

45. If the declination is 5° 40′ W, which one of the following magnetic bearing would represent the true bearing of S 25° 20′ E ?
   a. S 19° 20′ E
   b. S 31° 0′ E
   c. S 20° 0′ E
   d. S 19° 20′ W

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

List I

A. Vertical cliff
B. Steep slope
C. Hill
D. Overhanging

Lists II

1. Contour lines of different elevations unite to form one line
2. Contour lines of different elevations cross one another
3. Contour lines are closely spaced
4. Closed contour lines with higher values inside them

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

47. Triangulation station selected close to the main station for avoiding intervening obstruction is called

a. accentric station
b. pivot station
c. satellite station
d. tie station

48. If the equation of time is — 13′ 28.5″, then the Greenwich Apparent Time corresponding to zero hour Greenwich Mean Time on a day is
a. 13′ 28.5″
b. 46′ 31.5″
c. 23 h 46′ 31.5″ of same day
d. 23 h 46′ 31.5″ of previous day

49. 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

50. A vertical photograph was taken at an altitude of 1500 m above MSL. If the length of the camera is 20 m, the scale of photograph for a terrain lying at an elevation of 500 m is
a. 1 : 50
b. 1 : 100
c. 1 : 1000
d. 1 : 25

51. Assertion (A) : For a given soil, the optimum moisture content increases with the increase in compactive effort.
Reason (R) : Higher the compactive effort, higher is the dry density at the same moisture content.
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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

52. Assertion (A) : Stress paths can be plotted for stress conditions during triaxial test.
Reason (R) : It is not possible to control drainage in a triaxial test .
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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

53. Assertion (A) : The rates of settlement of building structures on dandy clay soils are faster compared to those of buildings constructed on clayey soils.
Reason (R) : The rate of consolidations dependent on the permeability of soils and the permeability of sandy clay is more than that of clayey soil.
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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

54. Assertion (A) : Pile driving formulae have very limited use in the case of cohesive soils.
Reason (R) : Pile driving in cohesive soils results in liquefaction of clays.
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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

55. Assertion (A) : Larger footings settle more than the smaller footings under the same load intensity.
Reason (R) : Size of the pressure bulb depends upon the size of the footing.
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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

56. Assertion (A) : In a spherical triangle, the sum of the three sides is always less than the circumference of the greater circle.
Reason (R) : The sum of the three angles of a spherical triangle is greater than two right angles, but less than six right angles.
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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

57. Assertion (A) : The critical combination of stresses on a cement concrete pavement

during summer is given by : load stress – warping stress + frictional stress.

Reason (R) : The critical combination of stresses in the cement concrete pavement during winter is given by : load stress + warping stress + frictional stress.

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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

58. Assertion (A) : The prime coat is an interface bituminous treatment when the existing base course has a pervious texture like water bound macadam.

Reason (R) : The primer has to get into the capillary voids in the existing base and it should be of low viscosity. Bituminous emulsion is generally used as a prime cost.

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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

59. Assertion (A) : Coning of wheels in railways does not cause wear and tear on the rails as well as on the tread of the wheels.

Reason (R) : The rails are tilted at an angle of 1 in 20 to reduce the wear and tear on the rails as well as on the tread of the wheels.

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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

60. Assertion (A) : Scissor crossing is provided where space does not permit provision of two separate cross-overs.

Reason (R) : A scissor crossing consists of four pairs of switches, six acute angle crossings and four obtuse angle crossing s and check rails.

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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

61. Assertion (A) : Surges can be positive or negative.

Reason (R) : Negative surges may occur when a gate at the head of a channel is suddenly opened or when a gate at tail end of a of a channel is suddenly closed.

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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

62. Assertion (A) : The future population is prediced on the basis of knowledge of the city and its environment.

Reason (R) : the future population depends on the trade and expansion of the city, discovery of mineral deposits, power generation etc.

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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

63. Assertion (A) : The leakage losses are less when the water supply in intermittent.

Reason (R) : Pressure is less in intermittent water supply.

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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

64. Assertion (A) : Alum is the most commonly used coagulant in water treatment.

Reason (R) : alum is very effective in killing pathogens present in water.

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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

65. Assertion (A) : Sewers are not allowed to flow full.

Reason (R) : reserve space in the sewer takes care of fluctuations in the sewage flow.

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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

66. Assertion (A) : In recent years, here has been a progressive increase in the percentage of solar ultra-violet rays reaching the earth's surface.

Reason (R) : In the last few years, there has been a progressive increase in the percentage of carbon dioxide in the earth's atmosphere.

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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

67. A rural water supply scheme serves a population of 10,000 at the rate of 50 liters per capita per day. For the chlorine does of 2ppm, the required amount of bleaching powder with 20% available chlorine will be

a. 0.5 kg
b. 5 kg
c. 10 kg
d. 15 kg

68. The usual size of residential ferrule bore varies from

a. 1 mm to 5mm
b. 10 mm to 50 mm
c. 100 mm to 500 mm
d. 1000 mm to 5000 mm

69. Reciprocating pumps are suitable fro

a. low discharge and high head
b. high discharge and low head
c. low discharge and low head
d. high discharge and high head

70. In which one of the following tests is the organic matter in the waster water used as food by micro-organisms ?

a. B.O.D.
b. Most probable number
c. C.O.D.
d. Chlorine demand

71. The function of algae in an oxidation pond is to

a. provide a mat over the surface of the oxidation pond so as to prevent evaporation of water
b. provide oxygen for bacterial to degrade organic matter
c. provide a greenish appearance to the pond
d. prevent the odour nuisance

72. At an incubation temperature of 20^{o} 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*
d. 350 mg / *l*

73. Consider the following pairs of treatment units and impurities removed :

1. Grit chamber : sand and slit
2. Detritus tank : Organic matter
3. Primary sedimentation tank : Suspended impurities
4. Aeration tank of activated : Oil and grease

Which of these pairs are correctly matched?

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

74. When a sewage is dispose din a river, the rate of depletion of dissolved oxygen of the river mainly depends on

a. biochemical oxygen demand of the sewage
b. chemical oxygen demean of the sewage
c. total organic carbon present in the sewage
d. dissolved oxygen present in the sewage

75. From a waste, the 5-day BOD at 20^{o}C is found to be 200 mg/*l*. For the same waste, 5-day BOD at 30^{o} C will be

a. less than 200 mg / *l*
b. more than 200 mg / *l*
c. 200 mg / *l*

d. zero, as the bacterial cannot withstand such a high temperature

76. The ultimate BOD value of a waste
a. increases with temperature
b. decreases with temperature
c. remains the same at all temperature
d. doubles with every 10^{o} C rise in temperature

77. For the design of a storm sewer in a drainage area, if the time of concentration is 20 min., then the duration of rainfall will be taken as
a. 10 min
b. 20 min
c. 30 min
d. 40 min

78. From ecological considerations, the minimum level of Dissolved Oxygen (DO) necessary in the rivers and streams is
a. 1 mg / *l*
b. 2 mg / *l*
c. 4 mg / *l*
d. 8 mg / *l*

79. The role of the bed material in a "packed tower" used for removing particular matter from gaseous emission is to
a. act as a filter bed to capture the particulates within the pores
b. provide a large surface area on which the particulate matter can be collected
c. reduce the flow of gas
d. uniformly distribute the spray of water

80. Which one of the following plume behaviors occurs when atmospheric inversion begins from the ground level and continues ?
a. Looping
b. Fumigation
c. Coning
d. Fanning

81. Which one of the following pollutants or pairs of pollutants is formed due to photochemical reactions ?
a. CO alone
b. O_3 and PAN
c. PAN and NH_3
d. NH_3 and CO

82. In the context of basic concept of an ecological system, the most appropriate definition of ecology is that it is a study of the
a. inter-relationship between organisms and the environment
b. relationship of human species with the industry
c. relationship of human species with natural resources
d. relationship of human species with air

83. Organisms that mineralize organic matter in an ecosystem are called
a. producers
b. consumers
c. decomposers
d. carnivorous

84. Aerobic method of composting practiced in India is called
a. Bangalore method
b. Nagpur method
c. Delhi method
d. Indore method

85. Which of the following statements related to C/N (Carbon/Nitrogen) ratio is not correct ?
a. Lower initial C/N ratio leads to loss of nitrogen and slows down the rate of decomposition
b. Higher initial C/N ratio leads to cell destruction to obtain nutrition
c. Higher initial C/N ratio leads to lower conservation of nitrogen in the finished compost
d. An initial C/N ratio of 30 to 50 is optimal for composting

86. The raw water entering an ideal horizontal settling tank contains following two types of particles :

Particle type	Settling velocity (m/h)	Concentration (mg/*l*)
I	3	200
II	1	300

When the surface overflow rate of the settling tank is $3m^3/m^2/h$, the concentration of the particles in the settled water will be
a. 100 mg/*l*
b. 200 mg/*l*
c. 300 mg/*l*
d. 400 mg/*l*

87. Which one of the following filters will produce water of higher bacteriological quality ?
   a. slow and filter
   b. rapid sand filter
   c. pressure filter
   d. dual media filter

88. Which one of the following sets of processes is a part of self-purification of streams ?
   a. Settling, bio-degradation and desalination
   b. Settling, bio-degradation and aeration
   c. Flotation, ion exchange and desalination
   d. Desalination, ion exchange and reverse osmosis

89. When sewage enters a flowing river, the rapid depletion of dissolved oxygen is due to
   a. change in temperature in river water
   b. the suspended particles in river and waste
   c. respiratory activity of aquatic plants in the river
   d. microbial activity

90. Consider the following advantages :
   1. Lower BOD concentration is supernatant liquor.
   2. production of a sludge with excellent dewatering capacity.
   3. Recovery of methane gas.
   4. Lower operation cost.

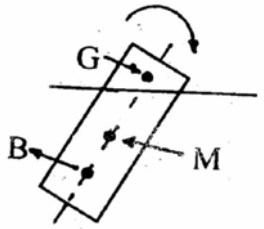
   Which of these are the advantages of anaerobic digestion over aerobic digestion?
   a. 1 and 4
   b. 1 and 2
   c. 2, 3 and 4
   d. 1, 2 and 3

91. The MLSS concentration in the aeration taken of extended aeration activated sludge process is 4000 mg/*l*. If one litre of sample settled in 30 minutes and the measuring cylinder showed a sludge volume of 200 ml, then the sludge volume index would be nearly
   a. 200
   b. 150
   c. 100
   d. 50

92. When the water surface coincides with the top edge of a rectangular vertical gate 40 m (wide) × 3 m (deep), then the depth of centre of pressure is
   a. 1 m
   b. 1.5 m
   c. 2 m
   d. 2.5 m

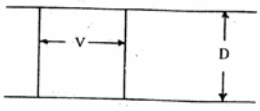
93. If a water tank, partially filled with water is being carried on a truck, moving with a constant horizontal acceleration, the level of liquid will
   a. rise and fall alternately one the front side of the tank
   b. fall on the rear side of the tank
   c. remain the same on both sides of the tank
   d. rise on the rear side and fall on the front side of the tank

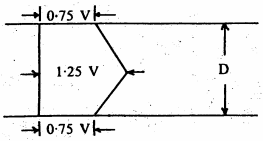
94. A body is floating as shown in the given figure. The centre of buoyancy, centre of gravity and metacentre are labeled respectively as B, G and M. The body is

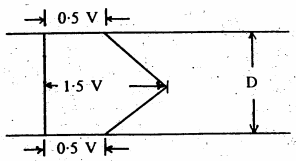


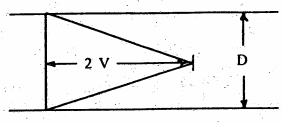
   a. vertically stable
   b. vertically unstable
   c. rotationally stable
   d. rotationally unstable

95. Consider the following velocity profiles in a pipeline :

1.


2.


3.


4.


Among these profiles, the momentum correction factor would be

a. least in 4
b. highest in 1
c. more in 3 than that for 2
d. the same in 1, 2, 3 and 4

96. If the error in the measurement of head in a 'V' notch is 1%, then the error in the measurement of discharge will be
a. 1%
b. 1.5%
c. 2%
d. 2.5%

97. 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

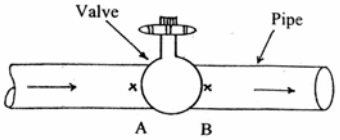
98. A pump running at 1414 rpm delivers 256 *l*ps of water against a head of 16 m. The pump is of the
a. normal speed radial type
b. double suction type
c. mixed flow type
d. axial flow type

99. Euler number or pressure coefficient may be represented as(notations have their usual meanings)
a. $\frac{\Delta p}{\gamma H}$
b. $\frac{\Delta p}{\left(\rho V^2/2\right)}$
c. $\frac{\Delta p}{\mu V/L}$
d. $\frac{\Delta p}{\rho L g}$

100. If the velocity profile in laminar flow is parabolic, then the shear stress profile must be
a. a hyperbola
b. a parabola
c. a straight line
d. an ellipse

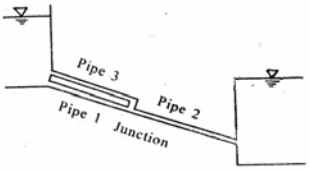
101. Consider the following statements regarding friction factor variation in a pipe flow :
1. In hydrodynamically rough boundaries friction factor 'f' is related to relative roughness ε/D, (ε s roughness and D is the diameter of pipe).
2. In hydrodynamically smooth boundaries, friction factor 'f' depends both on Reynold's number 'Re' and relative roughness.
3. If the friction factor, $f = \frac{0.316}{Re^{1/4}}$, then the value of the friction factor 'f' relates to the that of the region of turbulent flow in smooth boundary.
4. Friction factor is directly related to the nature of boundary layer in a pipe flow
Which of these statemtns are correct ?
a. 1, 2 and 4
b. 1, 2 and 3
c. 2, 3 and 4
d. 1, 3 and 4

102. A and B are at the same elevation of 2.5 m above datum in the value and pipe line shown in the given figure. Velocity head of 0.5 m, head loss in value of 0.2 m and pressure head of 2.5 m are the parameters at A. Piezometric head at B is equal to



a. 5.5 m
b. 5.3 m
c. 5.0 m
d. 4.8 m

103. Consider the following conditions for the pipe network shown in the given figure(Notations have the usual meaning with suffixes 1, 2 and 3 referring to respective pipes) :
1. $Q_1 = Q_3$
2. $Q_2 = Q_1 + Q_3$
3. $h_{f1} = h_{f3}$
4. $h_{f1} = h_{f2} = h_{f3}$



Which of these conditions must be satisfied by this pipe network ?
a. 1 and 3
b. 2 and 3
c. 1 and 4
d. 2 and 4

104. Consider the following statements :

1. In an open channel flow, energy grade line is obtained by adding datum head, pressure head and velocity head.
2. In an open channel, hydraulic grade line is the free surface itself.
3. For a pipe and an open channel of source dimension, the hydraulic gradient line is located at the same height above datum.
4. Energy gradient line of an open channel is always horizontal.

Which of these statements are correct ?

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

105. Maximum pressure rise due to water hammer in a pipe-line (a = area of the pipe; V_0 = velocity; g = acceleration due to gravity; t = time period; l = length of the pipeline) is

a. $aV_0 / 2g$
b. aV_0^2 / g
c. lV_0^0 / gt
d. independent of the dimensions of the pipe

106. For a wide rectangular channel using Manning's formula, the differential equation of gradually varies flow(with the usual notations) is given by

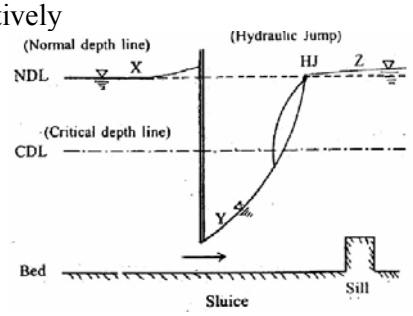
a. $\frac{dy}{dx} = S_o \frac{[1-(y_c / y)^{10/3}]}{[1-(y_0 / y)^3]}$

b. $\frac{dy}{dx} = S_o \frac{[1-(y_c / y)^{10/3}]}{[1-(y_0 / y)^3]}$

c. $\frac{dy}{dx} = S_o \frac{[1-(y_0 / y)^3]}{[1-(y_c / y)^3]}$

d. $\frac{dy}{dx} = S_o \frac{[1-(y_c / y)^3]}{[1-(y_0 / y)^3]}$

107. A sluice gate opening in a canal is shown in the given figure. The shapes of water surface profiles at X, Y and Z will be respectively



a. M_1, M_3 and M_1
b. M_2, M_3 and M_2
c. S_1, S_3 and S_2
d. H_2, S_3 and S_1

108. Consider the following statements :
The head-discharge characteristics curve of two centrifugal pump is

1. parallel can be obtained by doubling the ordinates .
2. series can be obtained by doubling the abscissa.

Which of these statements is/are correct ?

a. 2 alone
b. 1 alone
c. Neither 1 nor 2
d. 1 and 2

109. If the base period of a 6 hour unit hydrograph of a basin is 84 hours, then a 112 hour unit hydrograph derived from this 6 hour unit hydrograph will have a base period of

a. 72 hours
b. 78 hours
c. 84 hours
d. 90 hours

110. The stage in a river is 4.8 m, the water surface slope is 1 in 10,000 and the discharge in the steam is 600 m^3/s. If the stage remains the same and the water surface slope is 1 in 14,400, then the discharge in the stream will be

a. 300 m^3/s
b. 400 m^3/s
c. 600 m^3/s
d. 500 m^3/s

111. If an tangent drawn parallel to the demand lien from a ridge point of a mass curve does not intersect the mass curve again, it can be inferred that the

a. frequency of the flood entering into the reservoir is less
b. inflow into the reservoir cannot meet the demand
c. reservoir is overflowing resulting in wastage
d. reservoir can meet higher demand

112. In order to ensure that no scouring takes place in the bed of a channel of bed slope 'S' constructed on alluvial soil of particle size 'd' cm, the flow velocity should be restricted to

a. $4.85\ d^{1/2}\ S^{-1/6}$
b. $4.85\ d^{-1/2}\ S^{1/6}$
c. $0.45\ d^{1/2}\ S^{1/6}$
d. $0.48\ d^{1/2}\ S^{-1/6}$

113. Which one of the following sets is used to control the seepage through the foundations of an earth dam ?
   a. chimney drain, upstream blanket and cu-off trench
   b. cut-off sheet piles, upstream blanket and cut-off trench
   c. upstream blanket, cut-off sheet piles and chimney drain
   d. relief wells, upstream blanket and chimney drain

114. Consider the following statements :
   1. in designing a hydraulic structure in permeable foundation by Khosla's theory, the slope correction is applicable to piles located at the ends of the sloped floor only in a structure with one or more sloped floors.
   2. Khosla's theory can be correctly applied in alluvium of finite depth.
   3. Length of flow has lesser effect on exit gradient than the depth of piles.
   4. Intercepts between hydraulic gradient line and free water surface on the glacis and horizontal floor downstream is the unbalanced uplift in a structure.

   Which of these statements related to the design of hydraulic structure are correct ?
   a. 1, 2 and 3
   b. 1, 3 and 4
   c. 2, 3 and 4
   d. 1, 2 and 4

115. Match List I(Energy dissipation) with List II(Water level and slope condition) and select the correct answer :

   List I

   A. Roler bucket
   B. Ski-jump bucket
   C. Standing wave basin with depressed floor
   D. Standing wave basin with raised floor

   List II

   1. TWL(tail channel water level) is slightly above JWL (jump height water level) and the slope of the channel is mild
   2. TWL is considerably above JWL and the slope of the channel is mild
   3. TWL is slightly below JWL and the slope of the channel is mild
   4. TWL is considerably less than JWL and the slope of the channel is steep

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

116. If the depth is 8.64 cm on a filed over a base period of 10 day, then the duty is
   a. 10 hectares per cu.m/s
   b. 100 hectares per cu.m/s
   c. 864 hectares per cu.m/s
   d. 1000 hectares per cu.m/s

117. Given that atmospheric pressure head = 9 m, vapour pressure head (max.) = 1m, failure head = 40 m and cavitation coefficient $\sigma = 0.15$, the height at which the turbine can be set above the tail race level is
   a. 6 m
   b. 4 m
   c. 3 m
   d. 2 m

118. Specific capacity of a well is the
   a. volume of water that can be extracted by the force of gravity from a unit volume of aquifer
   b. discharge per unit drawdown of the well
   c. drawdown per unit discharge of the well
   d. rate of flow through a unit width and entire thickness of aquifer.

119. Consider the following statements :
   1. Specific speed uniquely determines the type, shape and design of the turbine.
   2. Both unit speed 'n_{11}' and unit discharge 'Q_{11}' are necessary to uniquely determine the type and design of the turbine.

   Which of these statemtns is/are correct in respect of a hydraulic turbine ?
   a. 2 alone
   b. 1 alone
   c. 1 and 2
   d. Neither 1 nor 2

120. If the radius of the centrifugal pump impeller is reduced from 10 cm to 9 cm, the head developed by the pump will change from 10m to
   a. 9 m of water
   b. 8.1 m of water
   c. 9.487 m of water
   d. 11.111 m of water