SSC JE PRE FLT 3

SSC JE PRE 10 OCTOBER 2023 Evening

Q1 For which of the following applications in leveling is an inverted staff reading most suitable?
(A) Leveling across a wall
(B) Leveling across an intervening, high or low ground
(C) Leveling across a steep slope
(D) Leveling across a lake

Q2 Match the basic terms used in the runoff given in the first column with their meanings in the second column.

A. Surface runoff	1. Delayed subsurface flow at shallow depth
B. Interflow	2. Unconfined flow of water over the ground surface
C. Base flow	3. Portion of water that moves laterally in the upper part of the soil

(A) A-1, B-3, C-2 (B) A-2, B-1, C-3
(C) A-1, B-2, C-3 (D) A-2, B-3, C-1

Q3 Which of the following methods are not used for the analysis and design of water tanks?
(A) Carpenter's simplified method
(B) Reissner's method
(C) Rankine method
(D) BIS code method

Q4 Shelby tube is one of the most widely used devices for.
(A) collecting undisturbed soil sample
(B) measuring effective stress and plotting Mohr envelope
(C) drilling rocks
(D) wash borings and drilling cobbles

Q5 Which of the following statements is INCORRECT?
(A) Lower water-cement ratio leads to lower workability.
(B) Graphically, the relation between the strength of concrete and the water-cement ratio is approximate cubic.
(C) Lower water-cement ratio is required when the concrete mix is mechanically compacted to achieve higher strength as compared to the hand-compacted concrete mix with higher water-cement ratio.
(D) Lower water-cement ratio is, the higher will be the strength of concrete.

Q6 The constituents of paint in suspension are held by which vehicle that also help in its evenly distribution?
(A) Binder
(B) Pigments
(C) Base
(D) Plaster of Paris

Q7 In the case of a_____the brickwork is not measured in cubic metres.
(A) reinforced brickwork
(B) half-brick wall
(C) brickwork in arches
(D) one and more than one brick wall

Q8 Which of the following stresses is mainly responsible for the stability of a masonry chimney?
(A) Tensile stresses due to earthquake.
(B) Bending stress due to horizontal wind pressure.
(C) Direct stress due to self-weight of the chimney.
(D) Shear stress due to wind pressure

Q9 As per IS 1203-1978 in the penetration test of bitumen, a standard tapered needle is used to calculate.
(A) softening point
(B) consistency of the bitumen binder
(C) the required quantity of colour
(D) binder capacity

Q10 Which of the following is a type of pump based on the type of power?
(A) High-lift pump
(B) Steam engine pump
(C) Low-lift pum
(D) Centrifugal pump

Q11 The horizontal platform that is used for connecting two flights of a staircase is called_____.
(A) Connector (B) landing
(C) thread (D) stringer

Q12 Which of the following options explain the effect of cold weather on concrete?
(i) Delay in setting and hardening
(ii) Freezing of concrete at early age
(iii) Alternate Freezing and Thawing
(A) Both (ii) and (iii)
(B) Both (i) and (ii)
(C) Only (i)
(D) (i), (ii) and (iii)

Q13 A road pavement should have which of the following qualities?
(A) Undulation (B) Deflection
(C) Non yielding (D) Yielding

Q14 The quantity of water in a reservoir, which cannot be utilized under normal operating conditions and is stored below the minimum pool level, is known as_____?
(A) dead storage
(B) live storage
(C) surcharge storage
(D) valley storage

Q15 Which of the following methods can be used to lower the water table by using gravity flow?
(A) Well point system
(B) Water suction method
(C) Dewatering
(D) Dehydration

Q16 Offsets from the tangents method of curve setting can be adopted if_____.
(A) both the deflection angle and the radius of curvature are large
(B) the deflection angle is large and the radius of curvature is small
(C) both the deflection angle and the radius of curvature are small
(D) the deflection angle is small and the radius of curvature is large

Q17 _____is the method of location an offset point from 2 different points on a chain line in such a way that all the three points form a near-equilateral triangle.
(A) Method of ties
(B) Swing offset method
(C) Oblique offset method
(D) Perpendicular offset method

Q18 Which of the following options represents the methods that can be used effectively to locate the routes of highways or railways from a contour map?
(A) Method of cross-section and the tracing of contour gradient method
(B) Method of cross-section and the equal depth contours method
(C) Tracing of contour gradient method and the equal depth contours method.
(D) Tracing of contour gradient method and the method of horizontal plane

Q19 Which of the following may NOT be a direct effect of noise pollution?
(A) Stomach disorder
(B) Hearing loss
(C) Migration of birds from cities
(D) Anxiety

Q20 According to IS 456 : 2000, for an RCC footing, the thickness of the footing at the edge shall NOT be less than_____for footing on soils.
(A) 150 mm (B) 100 mm
(C) 200 mm (D) 50 mm

Q21 Calculate the approximate mass density of oil with 4.5 m^3 of the volume and 40 kN of weight. (Consider g = 10 $m/s^{2)}$
(A) 889 kg/m^3 (B) 809 kg/m^3
(C) 920 kg/m^3 (D) 850 kg/m^3

Q22 In a fillet welded connection of steel structures, the sides containing the right angle of the fillet are called_____.
(A) throats (B) toes
(C) legs (D) roots

Q23 The dimension of Manning's roughness coefficient 'n' is.
(A) $L^{-1/3}T$
(B) $L^{-2/3}T$
(C) $L^{-1/6}T^{-1}$
(D) $L^{-1}/2^{T-2}$

Q24 In soil mechanics, what is Darcy constant?
(A) coefficient of liquefaction
(B) coefficient of permeability
(C) coefficient of compressibility
(D) coefficient of compaction

Q25 The coefficient of discharge (C_d) in terms of the coefficient of velocity (C_v) and the coefficient of contraction (C_c) is.
(A) $C_d = C_v/C_c$
(B) $C_d = C_v + C_c$
(C) $C_d = C_c/C_v$
(D) $C_d = C_v \times C_c$

Q26 Silt content in fine aggregate leads to_____.
(A) increased shrinkage
(B) excellent bond characteristics
(C) decreased permeability
(D) increased durability

Q27 What is the value of slope on the inside face of the flange for all the standard I-sections and channels sections of steel?
(A) $16\frac{3}{4}\%$ (B) $16\frac{2}{3}\%$
(C) $16\frac{4}{5}\%$ (D) $16\frac{1}{2}\%$

Q28 The ratio N_c/N_q for a purely cohensive soil is_____. (N_c and N_q are Terzaghi bearing capacity factors).
(A) 5.7 (B) 2.57
(C) 5.14 (D) 2.85

Q29 The bearings of two lines AB and AC measured by using a surveyor's compass are S26° 40′ E and N 18°30' W, respectively. The value of ∠BAC measured in clockwise direction is_____
(A) 188°10°
(B) 189° 10′
(C) 134° 10′
(D) 135° 10′

Q30 Which of the following methods of quarrying is suitable for costly, soft and stratified rocks such as sandstone, limestone, laterite, marble and slate?
(A) Blasting (B) Wedging
(C) Excavating (D) Heating

Q31 The mechanical device which is used to measure flow velocity, where the number of revolutions of the wheel per unit time are proportional to the velocity of the flowing water is the _____.
(A) rotameter (B) pitot tube
(C) current meter (D) float

Q32 As per the Indian Railway, the gauge is defined as.
(A) The clear distance between outer faces of two track rails
(B) The centre to centre distance of two track rails
(C) The length of the sleeper-width of the sleeper
(D) The clear distance between inner faces of two track rails

Q33

Identify water-borne diseases from the following.
I. Typhoid
II. Hepatitis
III. Malaria
(A) Only II and III
(B) Only I
(C) Only I and III
(D) Only I and II

Q34 The absence of a bond between reinforcing steel and surrounding concrete in a RCC beam will result in.
(A) linear variation of axial stress in a straight bar.
(B) parabolic variation of axial stress in a straight bar.
(C) constant stress at all points in a straight bar.
(D) zero axial stress at all points in a straight bar

Q35 Traffic engineering does NOT include which of the following?
I. Geometric design
II.Traffic studies and analysis
III. Road user characteristics
IV. Marshall mix design
(A) Only iii (B) Only i
(C) Both i and iv (D) Only iv

Q36 Level surface in terms of levelling is a_____.
(A) vertical surface
(B) horizontal surface
(C) curved surface
(D) datum surface

Q37 As per IS 456 : 2000, in reinforced and plain concrete footings, the thickness at the edge of the footing shall not be less than____for footings on soils.
(A) 100 mm (B) 120 mm
(C) 150 mm (D) 125 mm

Q38 In a plane survey, the length of an arc 12 km long lying on the earth's surface is_____greater than the subtended chord.
(A) 0.1 cm (B) 1 cm
(C) 100 cm (D) 10 cm

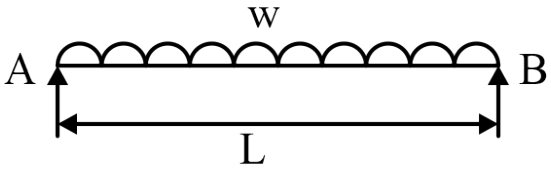
Q39 Select the correct option for the given statements.
Statement 1: Runoff is a function of precipitation, intensity, duration and its coverage.
Statement 2: The size of catchment has a definite effect on the runoff. More the area, lesser will be the runoff
(A) Statement 1 is true and statement 2 is false.
(B) Both statement 1 and statement 2 are true
(C) Both statement 1 and statement 2 are false
(D) Statement 1 is false and statement 2 is true

Q40 The density of mercury used in shrinkage limit apparatus is____(approx).
(A) 13.6 g/cc (B) 15.6 g/cc
(C) 14.6 g/cc (D) 12.6 g/cc

Q41 What should be the unit of measurement for earthwork in excavation in any type of soil and honeycomb brick work?
(A) m^3 and m (B) m and m^2
(C) m^2 and m^2 (D) m^3 and m^2

Q42 Select the option that is appropriate regarding the following two statements labelled Assertion and Reason.
Assertion : A loose, permeable, sandy soil has a higher infiltration capacity than that of a tight, clayey soil.
Reason : A soil with poor under-drainage has a higher infiltration capacity.
(A) Both Assertion and Reason are false.
(B) Both Assertion and Reason are true, but Reason is no the correct explanation of Assertion.
(C) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(D) Assertion is true, but Reason is false.

Q43 Find the bending moment at a distance L/4 from end A of simply supported beam as shown below.



(A) $\frac{wL^2}{32}$ (B) Zero

(C) $\frac{wL^2}{8}$ (D) $\frac{3.wL^2}{32}$

Q44 Arrange the various zones of distribution of soil moisture in the infiltration process.

A. Saturation zone

B. Wetting zone

C. Transmission zone

D. Transition zone

(A) C, A, D, B (B) C, D, B, A

(C) A, B, C, D (D) A, D, C, B

Q45 Direct stress due to self-weight and extreme bending stress at the base of a masonry dam is given as 22 N/mm^2 and 44 N/mm^2, respectively. Determine the value of extreme resultant stresses.

(A) Max. stress = 66 N/mm^2, Min. stress = 22 N/mm^2

(B) Max. stress = 44 N/mm^2, Min. stress = 22 N/mm^2

(C) Max. stress= 44N/mm^2, Min. stress = −66 N/mm^2

(D) Max. stress = 66N/mm^2, Min. stress = −22 N/mm^2

Q46 The science that deals with the occurrence, circulation and distribution of water of the earth and the earth's atmosphere is known as_____.

(A) environment (B) oceanography

(C) hydrology (D) hydraulic

Q47 The check for traversing by deflection angle method in a closed traverse of n sides is.

(A) the sum of angles must be equal to (2n – 4)°

(B) the sum of angles must be equal to (2n + 4)°

(C) the sum of angles must be equal to 180°

(D) the sum of angles must be equal to 360°

Q48 Dupit's equation is expressed for series connected pipes as: (where L_1, L_2, and L_3 are lengths of pipe 1, 2 and 3, d_1, d_2, d_3 are diameter of pipe 1, 2 and 3, L is equivalent length of pipe are D is equivalent diameter of pipe)

(A) $L/d^5 = L_1/d_1^5 - L_2/d_2^5$

(B) $L/d^6 = L_1/d_1^6 + L_2/d_2^6 + L_3/d_3^6$

(C) $L/d^5 = L_1/d_1^5 + L_2/d_2^5 + L_3/d_3^5$

(D) $L/d^5 = L_1/d_1^5 - L_2/d_2^5 - L_3/d_3^5$

Q49 By which method is valuation carried out to be initial or prime cost less depreciation?

(A) Initial cost-based valuation

(B) Profit-based on valuation

(C) Cost from detailed items

(D) Estimated cost from accounts

Q50 In case of staggered or zigzag riverting in the design of tension members of steel structure, the net cross-sectional area along the chains of rivets is

(A) decreased by an amount equal to $\frac{S^2t}{4g}$

(B) increased by an amount equal to $\frac{S^2t}{8g}$

(C) decreased by an amount equal to $\frac{S^2t}{5g}$

(D) increased by an amount equal to $\frac{S^2t}{4g}$

Q51 If a compression member of a steel structure is effectively held in position and restrained against rotation at both ends, then which of the following options represents the effective length of the member?

(A) 1.2 times of the actual length

(B) 0.65 times of the actual length

(C) 0.80 times of the actual length

(D) 2.0 times of the actual length

Q52 DDT belongs to the category of_____.

(A) Secondary air pollutants

(B) persistent pollutants

(C) primary air pollutants

(D) non-perisistent pollutants

Q53 In an old plan, a line was drawn to a magnetic bearing of 7° 25' with a magnetic declination of 2'5' west. If the present magnetic declination is 9° 40' west, then the new magnetic bearing should be drawn at _____.

(A) 15° (B) 4° 20'

(C) -4° 20' (D) -15°

Q54 Salvage value is the _____ of an asset after all depreciation has been fully expensed.
(A) depreciation (B) scrap value
(C) market value (D) book value

Q55 A centrifugal pump, driven by a directly coupled 2 kW motor of speed 1400 rpm, is proposed to be connected to a motor of speed 2800 rpm. The power of the motor should be.
(A) 24 kW (B) 8 kW
(C) 4 kW (D) 16 kW

Q56 Which of the following is NOT a natural source of air pollution?
(A) Pollens
(B) Volcanic gases
(C) Combustion of fossil fuels
(D) Wildfires by atmospheric temperature change

Q57 Hook length for a straight bar in terms of the diameter of the bar, d is.
(A) d (B) 18d
(C) 9d (D) 4.5d

Q58 Which of the following is just above the blind pipe in the tubewell?
(A) Fulcrum
(B) Barrel
(C) Main tube-well pipe
(D) Strainer

Q59 Proctor compaction test is made to determine the moisture content at which soil will be compacted to obtain_____.
(A) specific gravity
(B) minimum dry density
(C) maximum dry density
(D) porosity

Q60 The difference between the total head line and the hydraulic grade line in an open channel flow is called.
(A) pressure head
(B) total energy head
(C) velocity head
(D) elevation head

Q61 Which material is used for shuttering equipment, that requires very little maintenance and can be used for years?
(A) Timber (B) Epoxy ply
(C) Steel (D) Pressed board

Q62 Soil with particle size less than _____ mm is called fine-grained soil (silt or clay).
(A) 14.750 (B) 0.075
(C) 0.020 (D) 0.015

Q63 Which of the following factors does NOT contribute to soil/land pollution?
(A) Agricultural activities
(B) Mining wastes
(C) Eutrophication
(D) Domestic wastes

Q64 Which of the following sections is ideally suited for a compression member?
(A) Section with different moments of inertia about perpendicular axis passing through its center of gravity.
(B) Section with same moment of inertia about perpendicular axis passing through its center of gravity.
(C) Section with high amount of material unevenly distributed.
(D) Section with larger length.

Q65 The true reduced bearing is N 5° W and the magnetic declination is 2°E. Find the true bearing in the whole circle bearing system.
(A) 5° (B) 355°
(C) 353° (D) 357°

Q66 Select the option that is appropriate regarding the following two statements labeled Assertion and Reason.
Assertion: Good-quality irrigation water is one of the favorable conditions for sub-surface irrigation practice.
Reason: Irrigation water of bad quality may

block the buried perforated pipes in artificial sub-surface irrigation.

(A) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(B) Both Assertion and Reason are false.

(C) Both Assertion and Reason are true, but Reason is not the correct explanation of Assertion.

(D) Assertion is true, but Reason is false.

Q67 Which of the following does NOT represent the grade of Bitumen based on viscosity?

(A) VG-30 (B) VG-50

(C) VG-40 (D) VG-20

Q68 The processes used for the manufacture of cement can be classified into_____.

(A) Five (B) Four

(C) Three (D) Two

Q69 Blaine air permeability apparatus is used to determine the _____ of Portland cement.

(A) gradation

(B) fineness

(C) permeability

(D) specific gravity

Q70 The power of a centrifugal pump depends on the rate of flow of water. The rate of flow of water from the centrifugal pump is directly proportional to the _____.

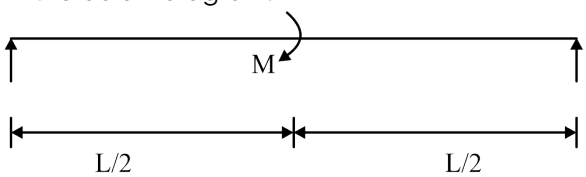
(A) inner diameter of the impeller

(B) outer diameter of the impeller

(C) total head

(D) revolutions per minute of the impeller

Q71 Find the value of shear force at one-fourth of the given span from the left support as shown in the below diagram.



(A) $\frac{M}{2L}(+ve)$ (B) $\frac{M}{L}(+ve)$

(C) $\frac{M}{2L}(-ve)$ (D) $\frac{M}{L}(-ve)$

Q72 Consider the following statements regarding horizontal equivalent and contour interval.

I. Horizontal equivalent between two contour lines is always constant.

II. Horizontal equivalent may be zero for a vertical cliff.

III. Contour interval should be inversely proportional to the scale.

IV. For detailed design work, large contour interval is taken. Which of the given statements are correct?

(A) II and IV (B) I and IV

(C) I and III (D) II and III

Q73 The foundation of the structure is designed for.

(A) shear failure of soils

(B) compression failure of soils

(C) bending failure of soils

(D) tension failure of soils

Q74 Which of the following statement for the included angle method is/are true?

Statement 1 : Included angles can be measured either clockwise or counter-clockwise.

Statement 2: The measured clockwise angles are interior angles if the direction of progress around the survey is counter-clockwise.

(A) Only Statement 2 is true

(B) Both Statement 1 and 2 are true

(C) Neither Statement 1 nor Statement 2 is true

(D) Only Statement 1 is true

Q75 The system of signals in which clusters of signals along a route display an opposite indication at the same moment is called_____.

(A) flexible progressive system

(B) alternate system

(C) simultaneous system

(D) simple progressive system

Q76 With reference to lacings under compression members of steel structures, the width of the lacing flat for 20 mm of nominal diameter of rivet is_____.

(A) 50 mm (B) 55 mm

(C) 60 mm (D) 65 mm

Q77 A vertical gate closes a horizontal tunnel 4 m high and 3 m wide running full with water. The bottom of the vertical gate is located at a distance of 8 m from the free water surface. Determine the total fluid force (in kN) acting on the gate.

(A) 720 (B) 706
(C) 740 (D) 730

Q78 Consider the following statements regarding, the function of the base course and subbase course in pavement layers.

I. Prevent mud-pumping in rigid pavement
II. Protect sub-grade of rigid pavement from frost action
III. Provide tensile strength to the flexible pavement
IV. Prevent warping stresses in rigid pavement.

Which of the above statements are correct?

(A) Both (ii) and (iv)
(B) Only (i), (ii) and (iv)
(C) Only (ii), (iii) and (v)
(D) Only (i), (ii)

Q79 In which type of dressing are only the edges of a stone block leveled with the help of a hammer?

(A) Pitched dressing
(B) Rough tooling
(C) Hammer dressing
(D) Chisel drafting

Q80 Select the correct option for the given statements.

Statement 1: When the crossing site is such that the canal FSL is well above the stream HFL, the choice between aqueduct and siphon aqueduct is made depending on the stream discharge.

Statement 2: For larger stream discharges (i.e. when the stream bed is much wider), an aqueduct is more suitable than a siphon aqueduct which requires lowering of the stream bed by a drop.

(A) Statement 1 is true and statement 2 is false
(B) Both statement 1 and statement 2 are true, and statement 2 is the correct explanation of statement 1
(C) Statement 1 is false and statement 2 is true
(D) Both statement 1 and statement 2 are true, but statement 2 is not the correct explanation of statement 1

Q81 Which of the following laboratory methods is more suitable to determine the permeability of less permeable soils?

(A) Constant head test
(B) Confined flow pumping test
(C) Unconfined flow pumping test
(D) Falling head test

Q82 The kinetic head of water flowing through a pipe of diameter 60 cm is 4 m, whereas the total head of the water at a cross-section, which is 6 m above the datum line, is 60 m. Determine the pressure head of the water.

(A) 56 m (B) 48 m
(C) 60 m (D) 50 m

Q83 As per IS 11624-1986, what will be the water quality rating of irrigation water when residual sodium carbonate (RSC) is in the range of 1.5 to 3?

(A) Low (B) High
(C) Medium (D) Very high

Q84 Which of the following statement is INCORRECT about the grading limits of fine aggregate?

(A) There are 3 grading zones as per IS 383-2016.
(B) IS 383 defines the grading zones of fine aggregates.
(C) Zone III corresponds to finer sand then Zone II.
(D) Zone II corresponds to normal sand.

Q85 If the 30th highest hourly volume is adopted for design, there will be congestion on the road for only.

(A) 30 hours in a year
(B) 70 hours in a year

(C) 29 hours in a year
(D) 0 hours in a year

Q86 According to IS 456 : 2000, value of design bond stress for plain bars shall be increased by_____% for deformed bars conforming to IS 1786.
(A) 25 (B) 60
(C) 40 (D) 10

Q87 As per IS 2470 codes, which of the following should be the minimum width of a septic tank for five users?
(A) 60 cm (B) 85 cm
(C) 55 cm (D) 75 cm

Q88 Before stone seasoning, the dressing of stones is done as it provides.
I. uniform appearance
II. good mortar joints
III. proper bedding
IV. poor water absorption
(A) Only (i)
(B) Only (i) and (ii)
(C) (i), (ii), (iii), (iv)
(D) Only (i),(ii) and (iii)

Q89 Silt ejector is provided_____.
(A) In the river far off from the weir on the upstream side
(B) In the canal on the downstream of head regulator
(C) In the river adjacent to the head regulator
(D) In the river on the downstream of the weir

Q90 As per IS 2386 (1963), the aggregate crushing value is calculated by using a single-sized aggregate, which is.
(A) passing 12.5 mm and retained on 10 mm sieve
(B) passing 4.75 mm and retained on 2.36 mm sieve
(C) passing 40 mm and retained on 20 mm sieve
(D) passing 20 mm and retained on 10 mm sieve

Q91 Pot and Bow Sleepers are which of the following type of sleepers?
(A) Steel sleepers
(B) Concrete sleepers
(C) Chock sleepers
(D) Cast iron sleepers

Q92 The type of pile foundation that is installed in soft strata to build a stable foundation for heavy structures by the method of resistance is called.
(A) tension piles
(B) end bearing piles
(C) friction piles
(D) screw piles

Q93 Which of the following statements regarding an electronic theodolite fitted with a graduated circle encoded in an incremental system is INCORRECT?
(A) The graduated circle is fixed and it does not move.
(B) Two photodiodes are placed perpendicular to each other over the graduated circle.
(C) One of the photodiodes is fixed and the other moves with the telescope.
(D) The graduated circle is made of glass.

Q94 A simply supported beam of length 4 m is subjected to a UDL of intensity 10 kN/m over the entire span of the beam. Determine the magnitude of the maximum shear force acting anywhere in the beam.
(A) 40/6 kN (B) 20 kN
(C) 40 kN (D) 10 kN

Q95 Which of the given options is NOT a commonly used minor method of disinfection of water during its treatment process?
(A) Boiling of water
(B) Treatment with ozone
(C) Treatment with iodine and bromine
(D) Treatment with silica

Q96 In India, the authority to issue the environmental no-objection certificate to start

an industry lies with the_____.
(A) Central Government
(B) Pollution Control Board
(C) State Government
(D) Forest Department

Q97 Which of the following is an example of sedimentary rock?
(A) Sandstone (B) Black flint
(C) Pumice (D) Basalt

Q98 As per components of the sewerage system, what is the meaning of 'outfall sewer'?
(A) A sewer which transports sewage from a treatment plant to final disposal point
(B) A sewer which transports sewage from a lateral sewer to a branch sewer.
(C) A sewer which transports sewage from a branch sewer to the main sewer
(D) A sewer which transports sewage from a house to lateral sewers

Q99 In India, stones with a specific gravity less than _____ are considered unsuitable for buildings.
(A) 3.2 (B) 3.6
(C) 2.8 (D) 2.4

Q100 Pavement blocks are mostly recommended during construction due to.
(A) water absorption capacity
(B) low maintenance
(C) efflorescence
(D) size of the block

Answer Key

Q1	(A)
Q2	(D)
Q3	(C)
Q4	(A)
Q5	(B)
Q6	(A)
Q7	(B)
Q8	(C)
Q9	(B)
Q10	(B)
Q11	(B)
Q12	(D)
Q13	(C)
Q14	(A)
Q15	(A)
Q16	(C)
Q17	(A)
Q18	(A)
Q19	(A)
Q20	(A)
Q21	(A)
Q22	(C)
Q23	(A)
Q24	(B)
Q25	(D)
Q26	(A)
Q27	(B)
Q28	(A)
Q29	(A)
Q30	(B)
Q31	(C)
Q32	(D)
Q33	(D)
Q34	(C)
Q35	(D)
Q36	(C)
Q37	(C)
Q38	(B)
Q39	(A)
Q40	(A)
Q41	(D)
Q42	(D)
Q43	(D)
Q44	(D)
Q45	(D)
Q46	(C)
Q47	(D)
Q48	(C)
Q49	(A)
Q50	(D)
Q51	(B)
Q52	(B)
Q53	(A)
Q54	(D)
Q55	(D)
Q56	(C)
Q57	(C)
Q58	(D)
Q59	(C)
Q60	(C)

Q61 (C)
Q62 (B)
Q63 (C)
Q64 (B)
Q65 (B)
Q66 (A)
Q67 (B)
Q68 (D)
Q69 (B)
Q70 (D)
Q71 (D)
Q72 (D)
Q73 (A)
Q74 (B)
Q75 (B)
Q76 (C)
Q77 (B)
Q78 (B)
Q79 (A)
Q80 (B)

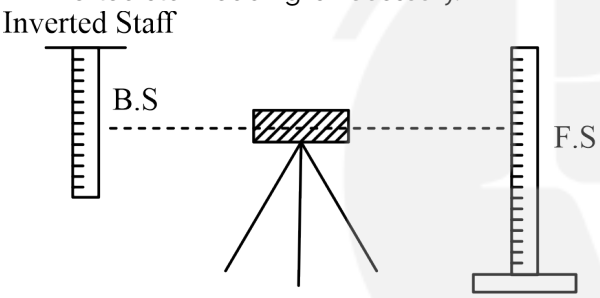
Q81 (D)
Q82 (D)
Q83 (C)
Q84 (A)
Q85 (C)
Q86 (B)
Q87 (D)
Q88 (D)
Q89 (B)
Q90 (A)
Q91 (D)
Q92 (B)
Q93 (B)
Q94 (B)
Q95 (D)
Q96 (B)
Q97 (A)
Q98 (A)
Q99 (D)
Q100 (B)

Hints & Solutions

Q1 Text Solution:

Inverted staff reading

- Inverted staff readings are used when a point to be leveled is above the instrument's line of sight, making it impossible to take a normal reading.
- When a point for which R.L is to be determined is at a very high level above the line of sight, for example, the roof of a building, chajja, etc the leveling staff should be inverted such that bottom of leveling staff should touch a point. It is taken as a negative reading.
- In the case of leveling across a wall, the top of the wall is above the line of sight, so an inverted staff reading is necessary.



Q2 Text Solution:

Surface Runoff

- The unconfined flow of water, which travels all the time over the surface and as overland flow and through the channels as open channel flow and reaches the catchment outlet is called as Surface Runoff.

Interflow

- A part of precipitation that infilters moves laterally through the upper crusts of the soil and returns to the surface at some location away from the point of entry into the soil.
- Also known as through flow, storm seepage, subsurface storm flow or quick return flow.

Base Flow

- The delayed flow that reaches a stream essentially as groundwater (sub- surface) flow at shallow depth is called base flow.

Q3 Text Solution:

Methods for water tank analysis and design:

Carpenter's Simplified Method: This method is specifically developed for the analysis of rectangular water tanks resting on the ground. It provides a simplified approach to calculating stresses in walls and slabs, making it a practical tool for engineers.

Reissner's Method: This method is a more general approach for analyzing thin-walled structures, including water tanks. It accounts for bending and membrane stresses, providing a more accurate analysis for complex tank shapes.

BIS Code Method: The Bureau of Indian Standards (BIS) codes, specifically IS 3370, provide comprehensive guidelines for the design and construction of reinforced concrete water tanks. They cover various aspects, including load calculations, material specifications, and reinforcement detailing.

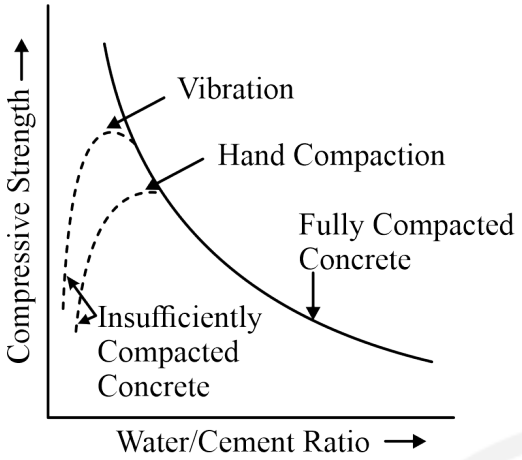
Q4 Text Solution:

- Galvanized Steel Shelby tube samplers are thin-walled, hollow steel tubes which are driven into the ground to extract a relatively undisturbed soil sample for use in laboratory tests used to determine permeability, compressibility and strength.

Q5 Text Solution:

- Water Cement ratio (W/C) is the ratio of the weight of water to the weight of cement in a concrete mix. This ratio decides the strength and workability of concrete.
- According to Abram's law, the strength of a concrete mix is inversely related to the weight ratio of water to cement.
- According to Abram's law, the compressive strength increases parabolically with decreasing water-cement ratio.
- A lower ratio leads to higher strength and durability but may make the mix difficult to

work with and form. Water cement ratio is inversely proportional to the strength of concrete, lower water-cement ratio leads to an increase in the bond between the aggregates, cement, and sand.



Q6 Text Solution:

Vehicle or drying oils:

Vehicle is an oil to which the base is mixed. It holds the constituents of paint in suspension and helps spread it over the surface to be painted. Vehicle also known as **binder**.

Q7 Text Solution:

According to IS 1200 (Part-3) 1976 clause 4.1.1 brickwork is measured in following way–

Brickwork	Measurement
Wall thickness < One brick thick	Sq. meter (measured separately)
One brick thick < wall thickness < 3 brick thickness	Multiplies of half brick occurs and it measures– (i) upto 1/4th brick - Actual measurement (ii) Exceeding 1/7th brick - full half brick
Wall thickness < three bricks	Actual thickness shall be measured

Q8 Text Solution:

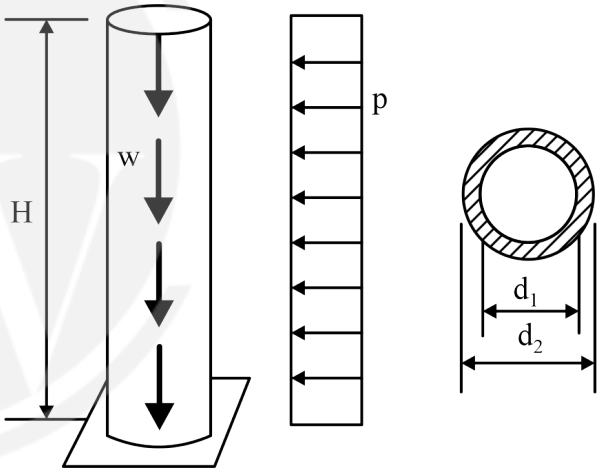
Chimney:

- Only two main forces are considered on the chimney, one due to wind pressure and the other due to the self-weight of the chimney.
- Direct stresses are developed due to the selfweight of the chimney and bending stresses are developed due to wind pressure on the chimney. Direct stresses are responsible for stability of chimney.
- For stress calculations or analysis offers on a chimney, the wind pressure is assumed to act on the projected area of the chimney.

Projected area:

The projected area is the area where the wind hits (or strikes) the chimney. Therefore this area is equal to the width of the outer face where the wind strikes multiplied by the height of the chimney.

Projected area = (Height of chimney) × (External diameter of chimney shaft)



Q9 Text Solution:

Penetration test

- Penetration value test on bitumen is a measure of hardness or consistency of bituminous material.
- Penetration value is the vertical distance traversed or penetrated by the point of a standard needle into the bituminous material under specific conditions of load, time and temperature.
- This distance is measured in one tenths of a millimeter.

- No. of sample = 3, needle dia = 1 mm, length = 50 mm, weight = 100 gm

Q10 Text Solution:

Pumps on the basis of type of power is classified as–

(i) Steam engine pump

(ii) Diesel engine pump

(iii) Electrically driven pump

Pumps on the basis of type of service is classified as–

(i) Low lift pump

(ii) High lift pump

(iii) Deep well pump

(iv) Booster pump

Q11 Text Solution:

Landing

• It is the horizontal platform provided at the top of a flight. If the landing is of a rectangular shape, having a length equal to twice the width of the stairs, the landing is called Half-Space Landing.

• If on the other hand, the stairs run at right angles to each other and are separated by a square landing, the landing is-called Quarter Space Landing.

Q12 Text Solution:

Effects of cold weather concreting

Delay in freezing and thawing

- It is likely that due to the varied behaviour of climatic conditions in the cold weather regions, the fresh concrete or hardened concrete gets subjected to freezing and thawing cycles. The durability of concrete gets greatly impaired due to this alternate freezing and throwing.

Freezing of concrete at an early age

- When the temperature goes below the freezing point, the free water contained in the plastic concrete freezes. Freezing of water, not only prevents the hydration of cement but also makes the concrete expand. This expansion disrupts concrete due to which irreparable loss of strength and quality takes place.

Delay in setting and hardening

- The rate of hydration depends upon the temperature. If the temperature is low, concrete takes a long time to set and a longer time to harden i.e., for the development of strength. The delay in setting time makes concrete vulnerable to frost attacks and other disturbances. Delay in the hardening period doesn't facilitate the removal of formwork in a short period. Also, the rate of progress of work will be very slow, which affects the economy.

Q13 Text Solution:

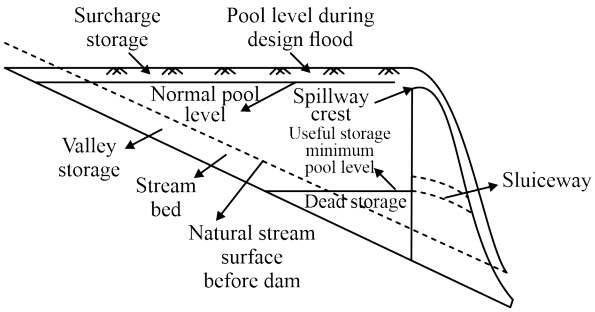
Non-yielding of pavement

The road pavement must be non-yielding in order to withstand the heavy wheel load and allow the movement of traffic with the least resistance possible. There must be no undulations in the pavement to allow smooth riding and comfort to passengers.

Q14 Text Solution:

1. Minimum pool level:- The minimum pool level is the lowest level up to which the water is withdrawn from the reservoir under ordinary conditions.

2. Dead Storage:- The volume of water held below the minimum pool level is called the dead storage. It is provided to cater for the sediment deposition by the impounding sediment laid in water. Normally it is equivalent to the volume of sediment expected to be deposited in the reservoir during the design life reservoir.



Zones of storage

Q15 Text Solution:

The ground water table can be lowered by following methods

1. Ditches and dumps
2. Well point system
3. Shallow well system
4. Deep well system
5. Vacuum method
6. Electro-osmosis method.

Well point system

- These are used to lower groundwater levels and help provide safe working conditions during excavation.
- Wellpoint systems consist of a number of small diameter wells, which are connected with a header pipe to a wellpoint pump.
- The wellpoint pump then creates a vacuum that draws water up from the ground.

Q16 Text Solution:

- Offsets from tangents method is the linear method used for setting out simple circular curves on the roadway.
- This method is adopted when both the deflection angle and radius of curvature are small.
- The offsets from tangents are calculated and set to get the required curve
- The offsets from the tangency is classified as-

(i) Radial offsets

(ii) Perpendicular offsets

Radial Offsets: If the centre of the curve is accessible from the points on the tangent then this method of curve setting is used.

Perpendicular Offsets: If the centre of a circle is not visible, perpendicular offsets from tangent can be set to locate the points on the curve.

Q17 Text Solution:

Method of ties-The purpose of a tie line is two fold, firstly it enables checking of the accuracy of the network and secondary locating the interior details, which are comparatively for away from the main survey line.

• Generally, it is a method of locating offset point from two different point on a chain line and all three points form a near equilateral triangle.

Q18 Text Solution:

Method of Cross-Section

- In this method, cross-sectional points are selected at regular intervals. Levelling is performed to determine the reduced levels of these points. The points are then marked on the drawing sheets, and their reduced levels (RL) are indicated. Contour lines are subsequently interpolated between these marked points.
- The spacing of cross-sections depends on factors such as the terrain characteristics, map scale, and desired contour interval. Typically, the spacing ranges from 20 m to 100 m. Smaller intervals are necessary when the ground level undergoes significant variations. It's important to note that the cross-sectional line does not always have to be perpendicular to the main line. This method is particularly suitable for road and railway projects.

Q19 Text Solution:

Noise pollution

Noise pollution also known as environmental noise or sound pollution is the propagation of noise with ranging impacts on the activity of human or animal life.

Effect of noise pollution-

- Repeated interference with sleep
- Effect on hearing or deafness
- Mental or physiological effect

- Hypertension or high blood pressure
- Migration of bird from cities
- Anxiety

Q20 Text Solution:

According to I.S. 456-1978, the thickness of reinforced concrete footing on piles at its edges is kept less than 15 cm.

However, from the updated IS Module of 456:2000:

As per IS 456: 2000, Clause 34.1.2, Thickness at the Edge of Footing

In reinforced and plain concrete footings, the thickness at the edge shall be not less than 150 mm for footings on soils.

For footings on piles, the thickness at the edge shall be not less than 300 mm (30 cm) above the tops of piles.

Q21 Text Solution:

Given that,

Volume of oil (V) = 4.5 m^3

Weight (W) = 40 kN = 40 × 10^3 N

$\text{Mass (M)} = \frac{40\times10^3}{10}\text{Kg}, = 4\times10^3\ \text{Kg}$

g = 10 m/s^2

$\text{Mass density} = \frac{\text{Mass}}{\text{Volume}} = \frac{4\times10^3}{4.5}$

= 888.88 kg/m^3

= 889 kg/m^3

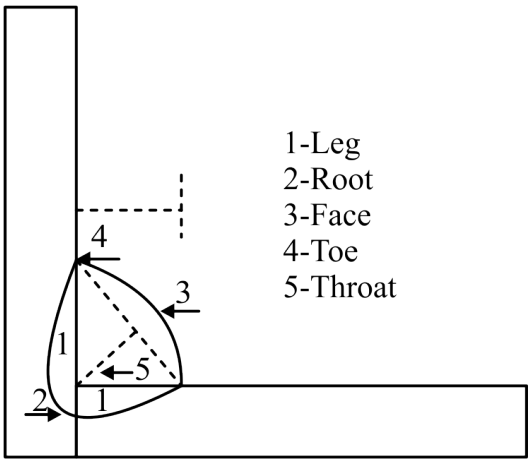
Q22 Text Solution:

Throats: The throat is the depth of the weld measured perpendicular to the weld face along the shorter leg.

Toes: The toes are the thin edges of the weld where the weld metal merges with the base metal.

Legs: The legs are the two sides of the triangular weld that meet at the right angle.

Roots: The root is the bottom of the weld where the weld metal meets the base metal at the joint.



Q23 Text Solution:

TERM	UNIT/DIMENSION
Manning co-efficient (N)	$L^{-1/3}T$
Permeability (k)	LT^{-1}
Specific speed of pump (Ns)	$M^0L^3/4T^{-3/2}$
Specific speed of turbine (Ns)	$M^{1/2}T^{-5/2}L^{-1/4}$
Chazy constant (C)	$M^0L^{1/2}T^{-1}$

Q24 Text Solution:

Darcy's Law states that velocity of flow through porous media is directly proportional to hydraulic gradient for any given saturated soil under steady laminar flow conditions.

If the rate of flow is Q through the cross-sectional area (A) of the soil mass, Darcy's Law can be expressed as

V α i or V = K × i

Q = K × i × A

k = coefficient of permeability of the soil

i = dh/dl

dh = difference in total heads

dl = length of small soil element

Q25 Text Solution:

Co-efficient of velocity – Ratio between actual velocity of a jet of liquid at vena contracta and the theoretical velocity of the jet.

$C_v = \frac{\text{Actual velocity}}{\text{Theoretical velocity}}$

$= \frac{v}{\sqrt{2gH}}\ [C_v = 0.95 - 0.99]$

Co-efficient of contraction –

$$C_c = \frac{\text{Area of jet of ven contracta}}{\text{Area of orifice}} = \frac{a_c}{a_o}$$

C_c = 0.611

Co-efficient of discharge–

$$C_d = \frac{\text{Actual discharbe}}{\text{Theoretical discharge}}$$

$$C_d = \frac{\text{Actual velocity}}{\text{Theoretical velocity}} \times \frac{\text{Actual area}}{\text{Theoretical area}}$$

$C_d = C_v \times C_c$ [C_d = 0.99]

Q26 Text Solution:

Excessive silt and clay contained in the aggregates may result in increased shrinkage or permeability in addition to poor bond characteristics. The excessive silt & clay may also necessitate greater water requirements for given workability.

Q27 Text Solution:

All standard I-sections and channel sections have a slope of $16\frac{2}{3}\%$ on the inner face of the flange.

- The rolled steel I-sections are most commonly used as beams because of greater lateral stability, larger moment of resistance and higher moment of inertia with less cross sectional area.
- The rolled I-section steel beams exhibit comparable torsional and warping rigidities.
- The channel section, which have one web and two flange exist.

Q28 Text Solution:

According to Tergazhi's bearing capacity Formula -

$Q_u = c.N_c + q.N_q + 1/2\ B.\gamma.N\gamma.$

In case of cohesive soil,

$\phi = 0$, $N_c = 5.7$, $N_q = 1$, $N\gamma = 0$

Then ultimate bearing capacity

$Q_u = 5.7c + q$

where shows,

$$\frac{N_c}{N_q} = \frac{5.7}{1} = 5.7$$

Q29 Text Solution:

Given that,

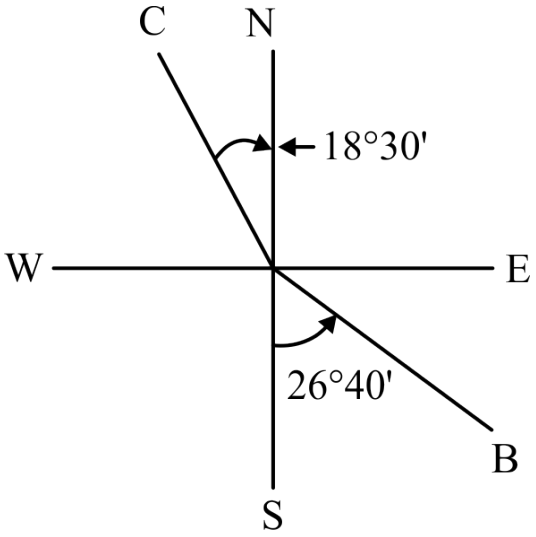
Bearings of two lines AB = S 26°40' E

AC = N 18°30' W

Then, the value of ∠BAC in clockwise direction–

∠BAC = 180 – 18°30' + 26°40'

∠BAC =188°10'



Q30 Text Solution:

Wedging:

- This method is mainly used for the rock of sedimentary type, which is comparatively soft, such as sandstone, limestone, marble, slate, laterite.
- In this method, first of all naturally occurring cracks or fissures are located in the rocks, to be excavated.
- The steel wedges or points are then driven with the help of a hammer, in hammer fissures or cracks and stones are detached.
- The split-out blocks of stone can be converted into marketable forms and supplied to users.

Q31 Text Solution:

Current meter: It is the device that is used to measure the velocity of the flow of fluid.

The relation between velocity and the number of revolutions completed by current meter is:

V= a x N + b

Where,

V = velocity in m/s, and

N = Number of revolutions done by current meter in 1 second

a & b = current meter constant.

Q32 Text Solution:

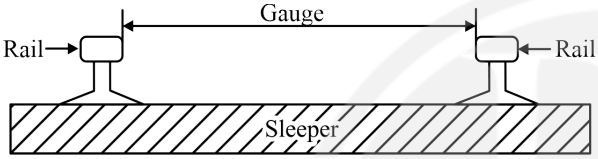
The gauge of a railway track is defined as the clear distance between the inner or running faces of two-track rails.

The distance between the inner faces of a pair of wheels is called the wheel gauge.

The following table gives the length of the rail for different types of gauges:-

Type of gauge	Length of Rail
B.G	12.8 m
M.G	11.89 m
N.G	11.89 m

Indian Railways has standardized a rail length of 13 m (previously 12.8 m) for broad gauge and 12 m (previously 11.8 m) for MG and NG tracks.



Q33 Text Solution:

Water-borne diseases are the ones caused by pathogenic microbes spread via contaminated water.

Various types of water borne disease-

1. Cholera
2. Typhoid
3. Shigellogis
4. Diarrhea
5. Amoebas
6. Food poisoning
7. Leptospirosis
8. Hepatitis A
9. Helminthiasis

Q34 Text Solution:

Bond between steel and concrete

- 'Bond' in reinforced concrete is the adhesion (adhesive force) between the reinforcing steel bar and the surrounding concrete.
- Due to this bond, it is possible to transfer the axial force from the reinforcing steel to the surrounding concrete thereby introducing strain compatibility and composite/combined action of steel and concrete which avoids slippage of reinforcing bars from within the concrete.
- The basic assumption of the flexural theory that plane sections remain plane before and after the bending is valid only if the bond between the concrete and the steel is effective.
- In the absence of a bond, the reinforcing bar in concrete is just like a string wherein the stress is constant at all the points on the string.
- It is because of the bond only that the axial stress (tensile, compressive) in the reinforcing bar varies along its length from point to point.
- This is essential to accommodate the variation in bending moment along the length of flexural members.

Q35 Text Solution:

Traffic Engineering

Traffic engineering is a subdiscipline of civil engineering that focuses on the safe and efficient movement of people and goods on roadways. It involves planning, designing, and operating streets and highways using engineering techniques.

Objective of Traffic Engineering

The basic objective of traffic engineering is to achieve the free and rapid flow of traffic with the least number of accidents. For this, various studies have been carried out. These studies include

1. Traffic characteristics
2. Traffic studies and analysis
3.Traffic control and regulations

Q36 Text Solution:

Level surface:

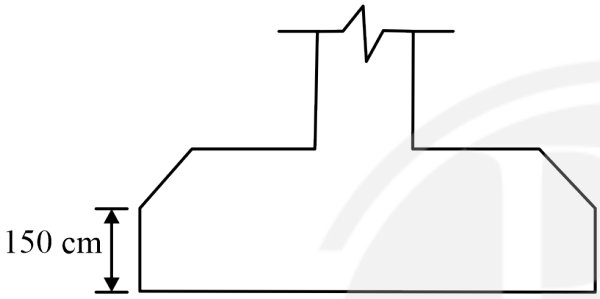
- A level surface is the equipotential surface of the earth's gravity field. It is a curved surface and every element of which is normal to the plumb line.
- A body of still water provides the best example of a level surface.

Horizontal plane/ surface:

- A horizontal plane is a plane that is perpendicular to the plumb line. It is also tangential to a level surface at a particular point.

Q37 Text Solution:

As per IS 456: 2000, Clause 34.1.2. Thickness at the Edge of Footing In reinforced and plain concrete footings, the thickness at the edge shall be not less than 150 mm for footings on soils. For footings on piles, the thickness at the edge shall be not less than 300 mm above the tops of piles.



Footing on piles

Q38 Text Solution:

Plane surveying:

- In this surveying, the mean surface of the earth is considered as a plane and spheroidal shape is neglected.
- All triangles formed by survey lines are considered plane triangles and the level line is regarded as straight.
- In everyday life, we are concerned with the small portions of the earth's surface and the above assumption seems reasonable So, the length of an arc 12 km long lying on the earth's surface is only 1 cm greater than a subtended chord.

Q39 Text Solution:

Runoff

- Runoff means the draining or flowing off of precipitation from a catchment area through a surface channel.
- Runoff represents the response of a catchment to precipitation. It reflects the integrated effects of a wide range of catchment, climate and rainfall characteristics such as magnitude, intensity, distribution according to time and space, and variability.
- High-stream discharges occur during monsoon month, and low flow during the rest of the year.
- Physical characteristics of the catchment, such as area, shape, slope and drainage channel pattern in the catchment, are some of the major static characteristics that affect the volume of the surface runoff and shape of the runoff hydrograph from a catchment due to a storm.

Q40 Text Solution:

Shrinkage limit test

Shrinkage limit is the defined as the smallest water content at which the soil is saturated.

- For determination of the shrinkage limit in the laboratory.
  Sample = 50 gm, Sieve size = 425 μ
- Density of mercury = 13.6 g/cc

Shrinkage limit, $W_s = \frac{(M_1 - M_s) - (V_1 - V_2)\gamma_w}{M_s}$

Q41 Text Solution:

Mass volume & thick work	Cubic Unit	Earthwork in Excavation, Earthwork in the filling,Brickwork with lime or cement mortar, Reinforced brickwork, Mass Concreting
Piece work Jor Job Work	Numbers	Cutting of large trees, Painting figures, Manholes or Inspection chambers, Door or Window handles, Pipe fittings
Thin, Shallow, or surface works	Square unit or area	Clearing of shrubs, Partition wall, Honeycomb brickwork, Brick

		Flat Soling, Formwork, DPC
Linear Works	unning Metre or linear measur ement	Cornices, Expansion joints, Ridge Hip and valley, Eaves Tiles, Handrails

Q42 Text Solution:

Infiltration Capacity

- The maximum rate at which a given soil at a given time can absorb water is defined as infiltration capacity.
- The infiltration capacity of an area is dependent on a large number of factors such as:

1. Characteristics of Soil: A loose, permeable, sandy soil has a higher infiltration capacity than a tight, clayey soil. A soil with good underdrainage has a higher infiltration capacity.

2. Surface of Entry: A surface covered with grass and other vegetation has lower infiltration capacity.

3. Fluid Characteristics: The turbidity of water, especially the clay and colloid content, is an important factor. Contamination of the water by dissolved salts can affect the soil structure and in turn affect the infiltration rate

Q43 Text Solution:

$\sum f_v = 0$

$R_A + R_B = w.L$ ...(i)

Then, moment taken at point 'A'

$R_B \times L - w.L \times \frac{L}{2} = 0$

From equation (i) $R_A = wL/2$

Then, moment at L/4 distance from A side-

$M_C = R_A \times \frac{L}{4} - w \times \frac{L}{4} \times \frac{L}{4} \times \frac{1}{2}$

$M_C = \frac{wL^2}{8} - \frac{wL^2}{32} = \frac{3\,wL^2}{32}$

Q44 Text Solution:

Infiltration Process

When water is applied to the soil surface, then water flows through the following zones.

1. Saturation Zone
2. Transition Zone
3. Transmission Zone
4. Wetting Zone
5. Wetting Front

Q45 Text Solution:

In a masonry dam due to self weight and bending stress-

Direct stress, $\sigma_d = 22\ N/mm^2$

Bending stress, $\sigma_b = 44\ N/mm2$

We know, for masonry dam, resultant combined stress-

σ = Direct stress (σ_d) ± bending stress (σ_b)

(i) Maximum stress, $\sigma = 22 + 44 = 66\ N/mm^2$

(ii) Minimum stress, $\sigma = 22 - 44 = -22\ N/mm^2$

Q46 Text Solution:

- The word 'Hydro' means water and 'logy' means science.
- It is the science that encompasses the study of water on the Earth's surface and beneath the surface of the Earth, the occurrence and movement of water, the physical and chemical properties of water, and its relationship with the living and material components of the environment.
- Therefore, it is the study of water moving through the earth's surface into the atmosphere and back in its various forms. It includes the -precipitation, evaporation, surface runoff, stream flows in catchments, groundwater etc.

Q47 Text Solution:

Closed traverse

- When the lines form a circuit that ends at the starting point, it is known as a closed traverse.

Properties of closed traverse:

- The sum of measured interior angles should be equal to (2N-4) × 90°, where N = the number of sides of the traverse.
- If the exterior angles are measured, their sum should be equal to (2N + 4) × 360°/n.
- The algebraic sum of the deflection angles should be equal to 360°, taking the right-

hand and deflection angles as positive and left-hand angle as negative.

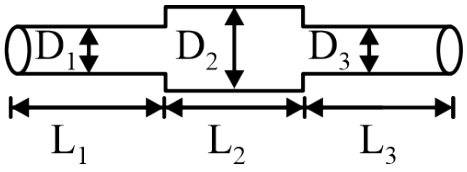
- The fore bearing of the last line should be equal to its back bearing ±180° measured from the initial station.

Q48 Text Solution:

Pipe connection–

(i) Equivalent pipe or series connection–

In this condition loss of head and discharge equal to the loss of head and discharge of a compound pipe consisting of different length.

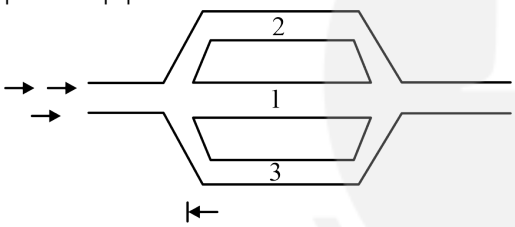


$$\Rightarrow \frac{L}{D^5} = \frac{L_1}{D_1^5} + \frac{L_2}{D_2^5} + \frac{L_3}{D_3^5}$$

This equation is known as Dupit's equation.

(ii) Pipe in parallel –

Discharge in main pipe = Sum of discharge in parallel pipes



$Q = Q_1 + Q_2 + Q_3$

Then,

$$h_f = \frac{4f_1L_1v_1^2}{2gD_1} = \frac{4f_2L_2v_2^2}{2gD_2} = \frac{4f_3L_3v_3^2}{2gD_3}$$

• If n-pipes of equal diameter (d) are placed instead of main pipe diameter (D)

Then, $d = \frac{D}{h^{3}/5}$

Q49 Text Solution:

Various method of valuation:

(1) Initial cost based valuation:- Prime or initial cost assumes that the value of a depreciating asset decrease uniformly over its effective life.

(2) Depreciation method of valuation:

(i) In this method, the structure is divided into four-part for calculating depreciation; wall, roofs, floor, Door and windows

(3) Value-based on cost:

(i) In this method, the actual cost of the construction is found out and valuation is done after considering depreciation and considering the type of construction and design of the construction.

(4) Valuation based on profit:

(i) Under this sub-head, valuation of cinemas, theatres, hotels, banks, big shop etc. located at suitable places is done where profit is of capitalized value.

(ii) The capitalized value is calculated by multiplying year's purchase with net profit.

(iii) The net profit is worked out after deducting all possible outgoings and expenditures from the gross income.

(iv) In such cases the cost will be too high as compared with the cost of construction actually incurred.

(5) Value by development method:

(i) This method is also used for working out the value of a building.

(ii) In certain cases, some additions, alterations and improvements are carried out which increases the cost of the building

(6) Rental method of valuation:

(i) In this method, the rent of the building is used as the base for calculating the value of the building.

Q50 Text Solution:

Zig-zag or staggered riveting–

In the case of zig-zag or staggered riveting, the net cross-sectional area along the chain of rivets is increased by an amount.

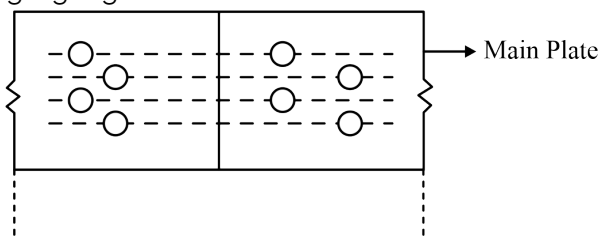
equal to $= \left(\frac{S^2t}{4g}\right)$

Net area along section ABCDE is given –

$$A_{net} = t\left[(b - nd) + \left(\frac{S_1^2}{4g_1} + \frac{S_2^2}{4g_2}\right)\right]$$

Where, S = Staggered pitch

g = gauge distance.



Q51 Text Solution:

Degree of end restraint of compression member	Effective length
Effectively held in position and restrained against rotation in both ends	0.65 l
Effectively held in position at both ends restrained against rotation at one end	0.8 l
Effectively held in position at both ends but not restrained against rotation	1.0 l

Q52 Text Solution:

DDT is a well-known example of a persistent pollutant due to its chemical structure and resistance to degradation. Persistent pollutants break down slowly in the environment and stay around for a long time, accumulating in living organisms and potentially causing harm.

Q53 Text Solution:

Given that,

Old magnetic bearing (M.B.) = 7°25'

Western declination, θ_w = 2°5'

We know,

True bearing =Magnetic bearing – Western declination

T. B.= 7°25' – 2°5' = 5°20'

When, present western declination = 9°40'

Then,

T. B. = M.B. – θ_w

5°20' = M.B. – 9°40'

M.B. = 15°

Q54 Text Solution:

Salvage Value: Salvage value is the estimated book value of an asset after depreciation is complete, based on what a company expects to receive in exchange for the asset at the end of its useful life. As such, an asset's estimated salvage value is an important component in the calculation of depreciation.

Q55 Text Solution:

Given that,

Speed of motor,

N_1 = 1400 rpm

N_2 = 2800 rpm

Coupled, P_1 = 2 kW

Power of centrifugal pump,

$P = kN^3$

Then,

$$\frac{P_1}{P_2} = \frac{N_1^3}{N_2^3}$$

$$P_2 = \frac{2\times(2800)^3}{(1400)^3}$$

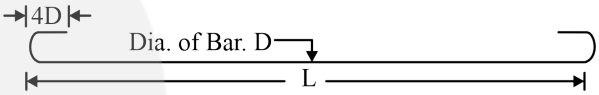
P_2 = 16 kW

Q56 Text Solution:

The combustion of fossil fuels is an artificial source of air pollution.

Q57 Text Solution:

The length of one hook may be taken as 9 times the diameter of bar and the total length is taken as L + 18 D, as shown in figure.



Length of one Hook = 9D

Total Length of Bar = L+18D

Q58 Text Solution:

The strainer well is the most common and widely used well. In common terms, the word "tube well" refers to the strainer type of tube well. In this type of well, a strainer, which is a special type of wire mesh, is wrapped around the main tube of the well and provided just above the blind pipe in the tubewell.

Q59 Text Solution:

Procter compaction test

Proctor compaction test is used to find the optimum level of moisture for soil and the maximum dry density. This test can be used to determine the optimum moisture content for compacting soil such as road bases, foundation pads and embankments.

- The value of the parameter of proctor test-

Feature	Standard Proctor	Modified Proctor

	Test	Test
Number of Layers	3	5
Weight of Hammer (kg)	2.495	4.54
Height of Fall (mm)	304.8	457.2
Volume of Mold (cc)	944	944

Q60 Text Solution:

The total energy line (TEL)

- It is the line joining the points representing the value of the total head (pressure head + velocity head + elevation head) at the various cross-sections of pipe in a pipe flow.

Hydraulic gradient line (HGL)

- It is the line joining the points representing the values of the Piezometric head (Pressure head + elevation head) at the various cross-sections of pipe in pipe flow.
- It will always lie below the total energy line in a pipe flow.

HGL = TEL - Velocity head

Velocity head = TEL - HGL

The difference between the total head line and Hydraulic gradient line is always constant for particular pipe flow and it is equal to the velocity head.

Q61 Text Solution:

Shuttering of concrete is done to give the concrete a form while it sets, preventing leaks, cracks, or uneven surfaces.

2. Steel Shuttering

Steel formworks are types of shuttering that are temporary construction elements used to hold concrete while it hardens. Steel is an ideal material for formwork because it will never bend or warp if designed appropriately while pouring concrete. Steel shuttering is capable of storing a big volume of concrete. Steel formwork can be reused many times and requires very little maintenance.

Q62 Text Solution:

According to the Indian Standard Soil Classification System (ISSCS),

- Soil with particle size > 300 mm is called Boulder.
- Soil with particle size in between 300 mm to 80 mm is called Cobble.
- Soil with particle size between 80 mm to 4.75 mm is called Gravel.
- Soil with particle size between 4.75 mm to 0.075 mm is called Sand.
- Soil with a particle size less than 0.075 mm is called Fine-Grained soil (Silt or Clay)

Q63 Text Solution:

Eutrophication:- It is a process of increasing biomass generation in a water body caused by increasing concentrations of plant nutrients most commonly phosphate and nitrate.

- When increase in nutrient concentrations leads to increasing growth of aquatic plants both macrophytes and phytoplankton.
- Eutrophication results from runoff from agricultural field and sewage pollution.
- Eutrophication does not contribute to soil pollution.
- Various types of domestic wastes agricultural activities, mining wastes etc. contribute to soil or land pollution.

Q64 Text Solution:

- An ideal compression section is one that has the same moment of inertia about any axis through its center of gravity. The tubular sections generally have the same moment of inertia about any axis through its center of gravity, hence tubular section is the ideal compression member.

Q65 Text Solution:

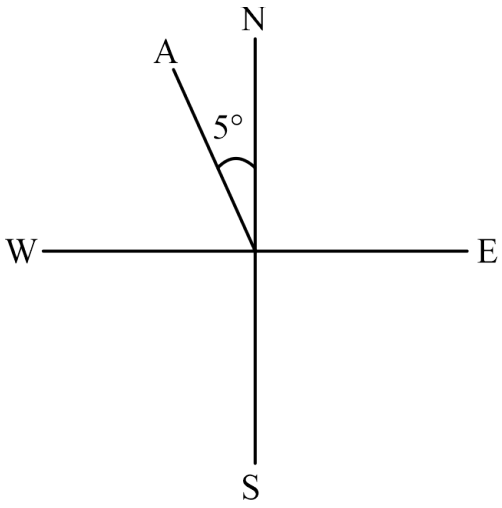
Given that,

Declination = 2°E

True reduced bearing = N5°W

We know that, true bearing always same, hence

true bearing in whole circle bearing system–



TB = 360° – 5° = 355°

Q66 Text Solution:

Sub-surface irrigation:- In this system, water is applied beneath the land surface. In artificial sub-surface irrigation, the water used should be of good quality so the perforation does not get clogged.

Q67 Text Solution:

As per IS 73:2006, bitumen is classified into four types based on viscosity grade.

Grade	Suitable for 7 day average maximum air temperature(°C)
VG-10	< 30
VG-20	30-38
VG-20	38-45
VG-40	>45

Note–Higher the number of grade, the harder the bitumen in the viscosity grading system.

Q68 Text Solution:

Manufacturing Process of Cement

The process of manufacturing of cement can be classified in 2 parts:

1. Dry Process

2. Wet Process

Q69 Text Solution:

The fineness of the cement is checked to test the proper grinding of the cement which significantly influences the rate of hydration. These two methods is used for the determination of the fineness of cement:

1) Air permeability method (Blaine)

The fineness of cement is measured as the specific surface. The higher the specific surface is, the finer the cement will be.

2) Sieving method

This method serves only to demonstrate the presence of coarse cement particles. This method is primarily suited to checking and controlling the production process. The fineness of cement is measured by sieving it on standard sieves. The proportion of cement of which the grain sizes are larger than the specified mesh size is thus determined.

Q70 Text Solution:

Centrifugal pump

A machine that converts mechanical energy into hydraulic energy by the action of centrifugal force is known as a centrifugal pump.

Power of centrifugal pump

$P = \frac{\rho QgHm}{1000}$

Discharge, $Q = \pi DBV_f$

Flow velocity, $V_f = \frac{\pi DN}{60}$

Then, $Q = \frac{\pi^2 D^2 B.N}{60}$

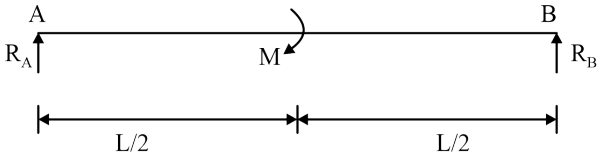
$Q \propto N$

where, N = speed (rpm)

Q71 Text Solution:

$\sum F_y = 0$

$R_A + R_B = 0$



Then, taking moments about point 'B'

$R_A \times L + M = 0$

$R_A = -\frac{M}{L}$, $R_B = \frac{M}{L}$

Hence, it shows the shear force act on simply supported beam subjected to moment everywhere is the same.

Which is S.F= $\frac{-M}{L}$

Q72 Text Solution:

Contour interval

- It is the vertical distance between the two consecutive contours.
- It is desirable to have a constant contour interval, however in some special cases it can be varied but in such cases, it becomes difficult to make an idea about the steepness or flatness of slope.
- It is generally kept in the range of (lm-15m).
- The smaller the contour interval, more is the precision in accuracy.

Horizontal equivalent

Horizontal distance between two points on any two consecutive contours is called horizontal equivalent.

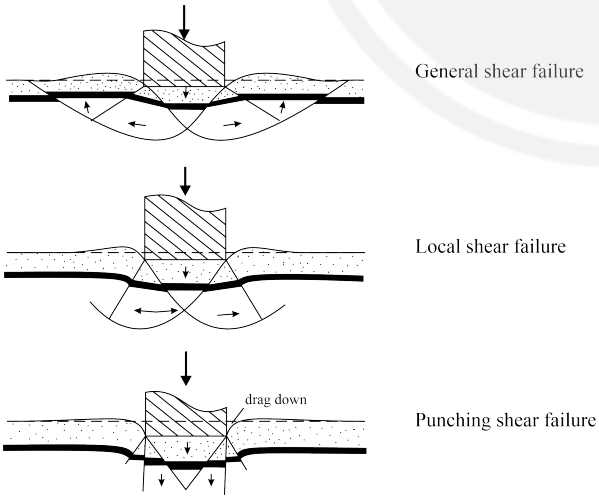
When several contour lines coincide or meet it indicates a vertical cliff. The horizontal equivalent is zero in vertical cliff.

Q73 Text Solution:

The foundation of the structure is designed for Shear Failure of Soils.

The various types of shear failure modes of the soils are as follows:

1. General Shear Failure.
2. Local Shear Failure.
3. Punching Shear Failure of foundation soils.



Q74 Text Solution:

Included angle method

An included angle at a station is either of the two angles formed by two survey lines meeting there and these angles should be clockwise.

- The method consists simply in measuring each angle directly from a back sight on the preceding station.
- The angle measured from the back station may be interior or exterior depending upon the direction of progress.
- When direction of progress in counter clockwise and so the angles measured clockwise are the interior angle.
- If it is clockwise then measured clockwise angle are the exterior angle.

Q75 Text Solution:

Alternate system: In this system, alternate signals or groups of signals show opposite indications in a route at the same time. This system is also operated by a single controller but by reversing the red and green indicator connections at successive systems. This system is generally considered to be more satisfactory than the simultaneous system.

Q76 Text Solution:

According to IS 800: 2007,

In bolted/riveted construction, the minimum width of lacing bars shall be three times the nominal diameter of the end bolt/ rivet.

The minimum width of lacing bars as per IS 800:2007 for bolted/riveted construction is 3d.

Here, the Nominal Diameter of the rivet = 20 mm

Width of lacing bar = 3 x 20 = 60 mm

Q77 Text Solution:

Given that,

horizontal tunnel, height h = 4 m,

width b = 3 m.

Bottom of vertical gate distance = 8 mm (from water surface)

We know that, Force, $F = \rho g \overline{x} A$

where, $\overline{x} = 6$

$F = 10^3 \times 9.81 \times 6 \times 12$

$F = 706.32$ kN

Q78 Text Solution:

Flexible pavement	Rigid Pavement
The load is transferred from	The load is transferred through

top to bottom by grain-to-grain contact.	slab action
Low or negligible flexural strength.	High flexural strength.
Joints are absent.	Expansion and contraction joints are provided
Low initial cost but high maintenance cost.	High Initial cost but low maintenance cost.
It includes Surface, base, sub-base, and subgrade layers.	It includes a concrete slab, base course, and subgrade layers.
Deformation in the top layers is transferred to underlaid layers	Deformation is only in the top layer of the concrete slab.
More suitable for stage construction	Less Suitable for stage construction.
Very less effect of temperature stress.	Effected by temperature and frictional stresses.

Q79 Text Solution:

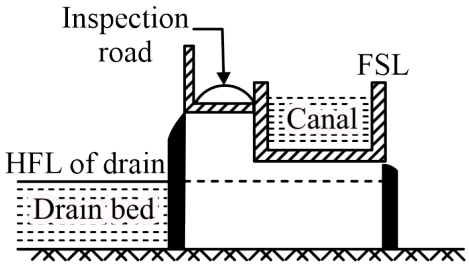
Pitched dressing:- In this type of dressing, only the edges of a stone block are made level with the help of a hammer, the unnecessary mass on the face is generally left intact.

Q80 Text Solution:

(1) Cross-drainage works carrying the Canal over the Natural Drain:

a. Aqueduct

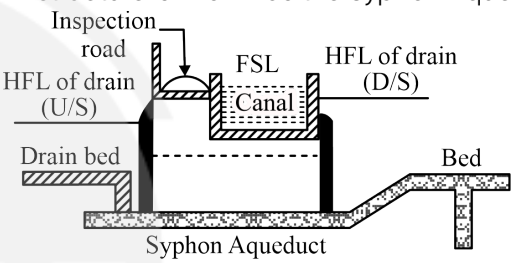
- In these works, the canal is taken over the natural drain, such that the drainage water runs below the canal either freely or under siphoning pressure.
- When the HFL of the drain is sufficiently below the bottom of the canal so that the drainage water flows freely under gravity, the structure is known as Aqueduct.
- An aqueduct is more suitable for larger stream discharges than a siphon aqueduct, which requires lowering the stream bed by a drop.



Aqueduct

b. Syphon Aqueduct

- If the HFL of the drain is higher than the canal bed and water passes through the aqueduct barrel under syphonic action, the structure is known as the Syphon Aqueduct.



Syphon Aqueduct

Q81 Text Solution:

Variable head permeability test (Falling head permeability test):

The falling head permeability test is used for relatively less permeable soils (fine-grained) where the discharge is small.

So here in clayey soil falling head permeability test can be used.

For falling head permeability test

$$K = \frac{a}{A}\frac{L}{t}\ln\frac{h_1}{h_2}$$

Where,

k = permeability,

a = Area of tube in m^2,

A = Area of sample in m^3,

t = time in sec,

L = length in m,

h_1 = Level of time t = 0, and h_2 = Level of time

Q82 Text Solution:

Given that,

Kinetic head = 4m
Datum head, z = 6 m
Total water head = 60 m
Diameter of pipes, d = 60 cm
As per Bernoulli's equation-
Total head =
Datum head + kinetic head + Pressure head
60 = 6 + 4 + Pressure head
Pressure head = 50 m

Q83 Text Solution:

According to IS 11624-1986 Water quality rating based on residual sodium carbonate–

Class	RSC range (me/l)
Low	Below 1.5
Medium	1.5-3.0
High	3.0-6.0
Very high	Above 6.0

Q84 Text Solution:

As per IS 383, Table 4(Clause 4.3)

- There are 4 types of grading zones for fine aggregates(sand) namely Grading Zones I, II, III, IV.
- All grading zones and their recommended value for different sieve sizes are given below:

IS Sieve Designation	Grading Zone I (percentage passing)	Grading Zone II (percentage passing)	Grading Zone III (percentage passing)	Grading Zone IV (percentage passing)
10 mm	100	100	100	100
4.75 mm	90-100	90-100	90-100	95-100
2.36 mm	60-95	75-100	85-100	95-100
1.18 mm	30-70	55-90	75-100	90-100
600 micron	15-34	35-59	60-79	80-100
300 micron	5-20	8-30	12-40	15-50
150 micron	0-10	0-10	0-10	0-15

Q85 Text Solution:

30th Highest Hourly Volume:

- It is the hourly volume that will be reached only thirty times or exceeded only 29 times in a year and all other hourly volumes of the year will be less than this value.
- 30th highest hourly traffic value is found to be satisfactory from the consideration of the facility as well as the cost. This is because the cost will be much lesser when compared to the peak hourly volume and there will be congestion only for 29 hours in the year and this is considered reasonable.
- The 30th highest hourly volume is generally adopted as the design hourly volume for the purpose of roadway facility design.

Q86 Text Solution:

Design bond stress:

- Bond stress is the result of the bonding between the concrete surface and the reinforcement steel.

As per IS 456: 2000, the design bond stress in the limit state method for plain bars in tension shall be as below:

Grade of Concrete	M20	M25	M30	M35	M40 and above
Design bond stress (τ_{bd}) (N/mm^2)	1.2	1.4	1.5	1.7	1.9

Note:

1. For deformed bars conforming to IS 1786, these values shall be increased by 60 percent.
2. For bars in compression. the values of bond stress for bars in tension shall be increased by 25 percent

Q87 Text Solution:

As per IS 2470 (Part I) - 1983, recommended sizes of septic tanks are given as–

No. of users	Length (m)	Breadth (m)	Liquid depth(m) Cleaning interval (1 year)	Liquid depth(m) Cleaning interval (2 year)
5	1.5	0.750	1.0	1.05
10	2.0	0.90	1.0	1.40
15	2.0	0.90	1.3	2.00
20	2.3	1.10	1.3	1.80

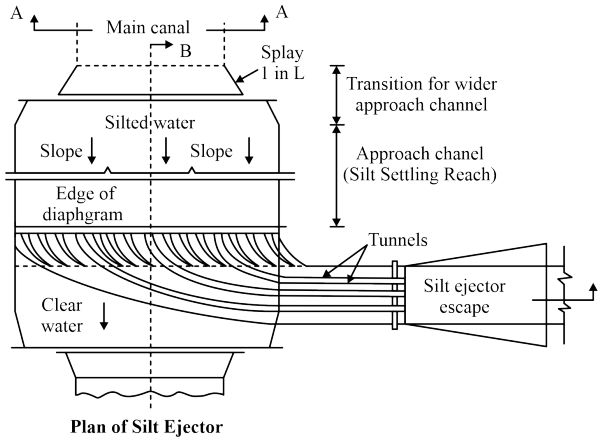
Q88 Text Solution:

Dressing of stone before seasoning is done to provide a uniform appearance, good mortar joints, and proper bedding.

Q89 Text Solution:

There are two popular silt regulation works:

1. **Silt excluders:** Silt excluders are constructed on the bed of the river, upstream of the head regulator.
2. **Silt ejectors:** Silt ejectors are constructed on the bed of the canal and a little distance downstream from the head regulator.



Plan of Silt Ejector

Q90 Text Solution:

The aggregate passing the 12.5 mm IS sieve and retained on 10mm IS sieve is selected for the aggregate crushing value test. The aggregate should be in surface dry condition before testing.

Q91 Text Solution:

Cast Iron Sleepers

- Cast iron sleepers are used extensively worldwide, but particularly in Indian railways.
- They come in two varieties: pot sleepers and plate-shaped cast iron sleepers.

Q92 Text Solution:

End bearing Pile: Piles which acts as columns and transfer the structural load to a hard and relatively incompressible stratum at a greater depth such as rock or dense sand are known as end-bearing piles. These piles derive the required bearing capacity from end bearing at the tip of the pile.

Q93 Text Solution:

Electronic theodolite:- Electronic theodolite consists of a telescope mounted on a base an electric read out screen to display vertical and horizontal angles. These are convenient as they create more accurate readings.

- Electronic theodolites function very similarly to optical theodolite and vernier transit.
- A very unique characteristic of the electronic theodolites is that they have the ability to electronically be interfaced to data collectors.

- In electronic theodolites, one of the photodiodes is fixed and other moves with the telescope and graduated circle is fixed and it does not move.
- In this method graduated circle is made of glass.

Q94 Text Solution:

Given that,

Span L = 4 m

UDL w = 10 kN

$\Sigma fy = 0$

$R_A + R_B = 40$ kN

Then, a moment taken at, 'A'

$$R_B \times 4 - 10 \times 4 \times \frac{4}{2} = 0$$

$R_B \times 4 = 80$

$R_B = 20$ kN

$R_A = 20$ kN

Hence, it shows 20 kN maximum shear force act.

Q95 Text Solution:

The following are the minor methods of disinfection:

- Boiling
- Excess Lime Treatment
- Iodine Treatment
- Bromine Treatment
- Ozone Treatment
- Potassium Permanganate Treatment
- Silver Treatment
- Ultra-Violet Ray Treatment

Q96 Text Solution:

Pollution control board of India issue the environmental no objection certificate to start an industry.

Q97 Text Solution:

- Sedimentary rocks are types of rock that are formed by the accumulation or sedimentation of minerals or organic particles at the Earth's surface, followed by cementation.
- Typical sedimentary rocks are sandstone, limestone, shale, Gypsum, etc. These are also known as aqueous or stratified rocks.

Q98 Text Solution:

Outfall Sewer:

The length of the main or trunk sewer between the connection of the lowest branch and the final point of disposal is known as an outfall sewer and it thus conducts the sewage either to the treatment plant or to the point of final discharge.

Q99 Text Solution:

A good building stone has the following properties:

- The percentage of wear in the attrition test should not be more than 3.
- Specific gravity for most of the building stones lies between 2.5 to 3. Stones of specific gravity less than 2.4 are unsuitable for building construction.
- The coefficient of hardness should be greater than 17.
- The percentage of water absorption by weight of stone should be less than 5
- The toughness index should not be less than 13
- Crushing strength should be greater than 100 N/mm^2

Q100 Text Solution:

Pavement blocks, also known as pavers or interlocking concrete blocks, are individual precast units used to create pavements for various applications. They offer numerous advantages over traditional materials like asphalt and concrete, making them a popular choice for a wide range of projects.

Benefits of Pavement Blocks:

Durability: They are highly resistant to heavy traffic, weather extremes, and wear and tear, offering a long lifespan.

Low Maintenance: Unlike asphalt or concrete, they require minimal maintenance, saving on long-term costs. Individual blocks can be easily replaced if damaged.

Versatility: Available in various shapes, sizes, colors, and textures, allowing for creative design possibilities and customization.

Flexibility: Individual blocks can be removed and replaced for repairs or access to underground utilities.

Environmentally Friendly: Many are made from recycled materials and promote water infiltration, reducing runoff and benefiting the environment.

Pedestrian-Friendly: Textured surfaces offer better traction and gaps between blocks reduce heat buildup, creating a safer and more comfortable walking experience.

Aesthetics: They enhance the visual appeal of spaces with their diverse colors, textures, and patterns.

Cost-Effective: While the initial cost might be higher, their durability, low maintenance, and ease of repair make them cost-effective in the long run.