1) Identify the CORRECT statement/s regarding Venturimeter device.

a) It works on Bernoulli's principle.
b) Ratio of throat diameter to main pipe diameter in a Venturimeter lies in the range of 0.3 and 0.75.
c) It is usually suitable for Flow rate measurement.

A) a only
B) c only
C) a and c
D) All a, b and c

2) The following are the consistency limits available for the soil, Liquid limit = 35%, Plastic limit=15%, Flow index = 11, water content=32%. Find the Plasticity index, Consistency index and Toughness index respectively.

A) 22, 0.16, 2
B) 20, 0.15, 1.8
C) 25, 0.12, 2
D) 20, 0.13, 1.9

3) On a vertical plane surface submerged in liquid, the distance (d) of the centre of pressure from free surface of liquid is given by which formula among the following options?

( Given: d = Distance of the centre of pressure from free surface of liquid

$I_G$ = Moment of Inertia of area about an axis passing through the C.G of the area and parallel to the free surface of liquid

A = Total area of the surface

h = Distance of C.G of the area from the free surface of liquid

ρ = Density of liquid )

A) $d = \frac{I_G}{Ah} + \rho$

B) $d = \frac{I_G}{Ah} + h$

C) $d = \frac{I_G}{A} + h$

D) $d = \frac{AI_G}{h} + h$

4) Fire demand is one of the factors for estimating the quantity of water required in a certain community. The Kuchling's formula for estimating the fire demand (Q) in litres per minute is given by

(Here P= Population in thousands)

(Symbols and notations carry their usual meaning)

A) Q = 1136.5 (P/5 +10)
B) Q = 2500 (P/5 +10)
C) Q = 3182 √P
D) Q = 5663 √P

5) In the design of canals, the ratio of rate of change of discharge in the outlet to the rate of change of water level in the distributary channel is termed as:

A) Drowning ratio
B) Efficiency
C) Setting
D) Sensitivity

6) What are the indicators used for measuring acidity in general?

A) Methyl orange and phenolphthalein
B) Potash alum and baking soda
C) Ammonium sulphate and sulphuric acid
D) Magnesium dioxide and nitrous oxide

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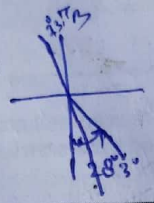
24) Which of the following statements is INCORRECT with respect to the calculation of LST (Latest Start Time) for the activities involved in a network diagram?

A) At the end event LST is equal to Zero
B) The calculation of LST starts from end event
C) The computations are done through backward pass method
D) The computations of LST usually proceeds right to left

25) What will be the true bearing of a line AB, if its magnetic bearing is S 28° 30' E and the declination is 7° 30' West?

A) N 36° 00' E
B) S 26° 00' E
C) S 56° 00' E
D) S 36° 00' E



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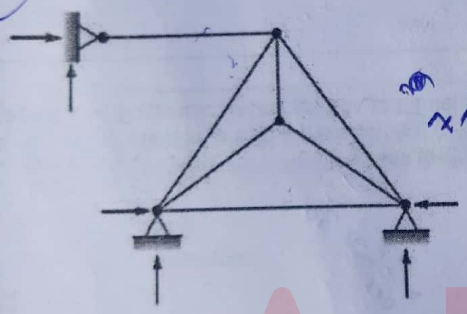


Find the degree of static indeterminacy, for a two dimensional truss (or frame) shown in the figure above.

A) 1
B) 2
C) 3
D) 4

27) The efficiency of a sedimentation tank (in percentage) is calculated using which of the following formulas?

A) (Settling velocity x Overflow velocity) x 100
B) (Settling velocity / Overflow velocity) x 100
C) (Settling velocity - Overflow velocity) x 100
D) (Settling velocity + Overflow velocity) x 100

28) A 50 cc of water passed through empty dry filter paper whose initial weight is 1.46 g and after oven drying the weight is 1.42 g. What will be the suspended solids?

A) 500 mg/l
B) 400 mg/l
C) 800 mg/l
D) 600 mg/l

29) As per IS:456-2000, a simply supported beam shall be considered as a deep beam if the ratio of its effective span to overall depth is less than

A) 1.5
B) 2
C) 2.5
D) 3

30) Which path of the network analysis usually has zero slack time?

A) Critical path
B) Non critical path
C) Both critical and non-critical paths
D) Dummy Path

31) With reference to Planning, identify the CORRECT statements.

1. Dummy activity maintains the logical interrelationship between different activities.

2. Dummy activity keeps the numbering system of the network unique.

3. Dummy activity is a resource oriented activity.

A) 1 and 2
B) 2 and 3
C) 1, 2 and 3
D) 1 and 3

32) What is (total annual average water consumption of community) / (population × 365)?

A) Percapita water demand
B) Discharge
C) Water quality
D) Amount of water level stored

33) What will be the sensitivity of soil specimen if unconfined compressive strength in undisturbed mode is 280 g and on remoulding the unconfined compressive strength is 66 g?

A) 2.82
B) 5.93
C) 4.24
D) 6.52

34) Which of the following refers to a steel bar bolted to the ends of two rails to join them together in a track?

A) Dog Spike
B) Screw Spike
C) Fish Plate
D) Rail Clip

35) According to IS:456-2000, in a R.C.C slab the diameter of reinforcing bars should NOT exceed

A) one half of the total thickness of the slab
B) one fourth of the total thickness of the slab
C) one eighth of the total thickness of the slab
D) one sixteenth of the total thickness of the slab

36) What is defined as the ratio of weight of water to weight of solids in a given mass of soil (in percentage)?

A) Water content
B) Void ratio
C) Specific gravity
D) Density

37) A two dimensional plane truss is known as an 'UnstableTruss' in which of the following conditions? (m = number of members, j = number of joints and r = number of unknown reactions)

A) $m = (3r-j)$
B) $m > (2j-r)$
C) $m < (2j-r)$
D) $m < (4j-r)$

38) For the design of cross drainage works, the waterwa of the drain is determined using Lacey's equation given by (Here: P is the wetted perimeter in meters and Q is the tot discharge in cumecs.)

(Symbols and notations carry their usual meaning)

A) $P = 4.75Q^2$
B) $P = 1.5\sqrt{Q}$
C) $P = 1.5Q^2$
D) $P = 4.75\sqrt{Q}$

39) A revised estimate for a contruction project is usually prepared if the sanctioned estimate value exceeds

A) 1.5%
B) 2%
C) 3.5%
D) 5%

40) Find the length of vertical curve connecting two grades + 0.4% and - 0.3%, where the rate of change of grades is 0.1% per 30 m at summit.

A) 210 m
B) 250 m
C) 230 m
D) 270 m

41) Which one of the following options is NOT a condition or property for an ideal fluid?

A) Zero viscosity
B) Incompressible
C) Zero surface tension
D) Compressible

42) Which of the following options is usually preferable in a prestressed concrete member?

A) Only high strength concrete
B) Low strength concrete
C) Only high tensile steel
D) Both high strength concrete and high tensile steel

70 C

43) The deflection of a Cantilever Beam of length L with a point load W at the free end is given by

A) $(WL^3) / (3\ EI)$
B) $(WL^3) / (4\ EI)$
C) $(WL^2) / (3\ EI)$
D) $(WL^4) / (4\ EI)$

44) As per the theory of Simple bending, the value of the Young's Modulus of elasticity is:

A) Greater in tension than in compression
B) The same in tension and compression
C) Greater in compression than in tension
D) Always equal to unity in tension alone

45) What is the dimensional formula for pressure gradient?

A) $ML^{-1}T$
B) $ML^{2}T$
C) $ML^{-2}T^{-2}$
D) $ML^{-1}T^{-2}$

46) What is the term used in chain surveying, for the lateral distance measured perpendicular to the chain line?

A) Oblique offset
B) Perpendicular offset
C) Rear offset
D) Parallel offset

47) A 20 m steel tape was standardised at a temperature of 30°C under a pull of 5 kg. The tape was used in catenary to fix a distance of 20 m between two points at 40°C under a pull of 10 Kg. Young's modulus E=2.1×10⁶ kg/cm², Area = 0.001 cm², W=0.423 g, coefficient of thermal expansion $\alpha=11\times10^{-6}$ /°C. Here to arrive at the total correction (subtractive), the correction for Temperature is calculated using which of the following formulas?

A) $C_t = \dfrac{5\alpha\,(T_m \cdot T_0)}{L}$

B) $C_t = \alpha\,(T_m + T_0)3L$

C) $C_t = \alpha\,(T_m - T_0)L$

D) $C_t = \alpha\,(3T_m - T_0)L$

48) What is the horizontal distance between two successive contours called?

A) Contour interval
B) Horizontal equivalent
C) Contour gradient
D) Contour map

49) Identify the CORRECT relationship, between the elasticconstants of a material.

a) E = 2G(1+1/m)
b) E= 3K (1-1/m)
c) E= 2K(1-3/m)

where E= Young's Modulus, K= Bulk Modulus, G=Shear Modulus, 1/m= Poisson's Ratio

A) a only
B) c only
C) a and c
D) a and b

50) What is the slope of borders in border irrigation method?

A) 0.05-2%
B) 4-5%
C) 5-10%
D) 15-20%

51) What will be the speed of vehicle if length of transition curve is 70 m and superelevation is 15 cm assuming rate of superelevation as 2 cm/s?

A) 6.8 m/s
B) 7.5 m/s
C) 9.3 m/s
D) 5.2 m/s

52) In long wall - short wall method of a building estimation, if "l" is the center to center length of wall "d" is the breadth of the wall, then length of long wall (out to out) is given by

A) l+d
B) l-d
C) l+2d
D) l-2d

53) Which of the following satisfies the Laplace Equation?

A) Stream function and Velocity Potential Function
B) Only Velocity Potential function
C) Only Stream function
D) Neither Stream function nor Velocity Potential function

54) Select the CORRECT relationship between net irrigation requirement and field irrigation requirement. (Here $h_a$ = water application efficiency)

A) NIR=FIR /$h_a$
B) NIR=FIR +$h_a$
C) NIR=FIR - $h_a$
D) NIR=$h_a$ x FIR

55) Which equation states that during a fluid flow, "piezometric head + velocity head = constant" along streamline?

A) Bernoulli's equation
B) Continuity equation
C) Euler's equation
D) Laplace formula

56) What is the term used for the distance between two rails in a railway track?

A) Track gauge
B) Track base
C) Sleeper gauge
D) Ballast width

57) The relationship between curvature correction (Cc) and refraction correction (Cr) for levelling works is given as:

A) Cr =1/7 Cc
B) Cr =1/5 Cc
C) Cr =1/2 Cc
D) Cr =1/8 Cc

58) As per IRC, if V is the speed of the vehicle in km/hr and R is the radius of the curve in meters, then the length of the transition curve for mountainous and steep terrains (hilly track) (for a two lane highway) should not be less than

A) $V^2/R$
B) $9.81V^2/R$
C) $3.6V^2/R$
D) $V/R^2$

59) Read the following statements and choose the CORRECT option.
(i) The effective depth of a T-Beam is the distance between the top of the flange and the centre of the tensile reinforcement.

(ii)For designing purposes, the overall depth of a simply supported T-Beam is usually assumed as 1/12 to 1/15 of the span.

A) (i) is TRUE and (ii) is TRUE
B) (i) is TRUE and (ii) is FALSE
C) (i) is FALSE and (ii) is TRUE
D) (i) is FALSE and (ii) is FALSE

60) Lead Time in materials/inventory management for a company usually refers to the:

A) Time required for only the dumping of material at the client place
B) Time taken to only order certain materials in a company
C) Time elapsed between ordering, receiving and putting the material into use
D) Time taken to create a product in a company

61) Read the following statements and choose the CORRECT option with respect to the velocity potential function in the Kinematics of a fluid flow.

(i) If the velocity potential exists, the flow should be irrotational.

(ii) If the velocity potential satisfies the Laplace equation, it represents the possible steady incompressible irrotational flow.

A) (i) is TRUE and (ii) is TRUE
B) (i) is TRUE and (ii) is FALSE
C) (i) is FALSE and (ii) is TRUE
D) (i) is FALSE and (ii) is FALSE

62) A vehicle has a wheel base of 5 m. What is the approximate off-tracking with a mean radius of 20 m?

A) 0.5 m
B) 0.7 m
C) 0.6 m
D) 0.8 m

63) Which of the following options is defined as the permanent deformation of a material that occurs at high temperatures under constant loading over a long period of time?

A) Creep
B) Toughness
C) Density
D) Corrosion Resistance

64) Which of the following usually helps to enable the trafficability of rail?

A) Tongue rail
B) Lead rail
C) Turnout
D) Dog Spike

65) If the density of a fluid remains constant throughout the volume, then it implies which type of flow?

A) Compressible flow
B) Incompressible flow
C) Uniform flow
D) Non uniform flow

66) In hydrostatics, when the fluid is at rest and there is no relative motion between adjacent fluid layers, the velocity gradient will be

A) Unity
B) Maximum
C) Infinity
D) Zero

67) Identify the formula for Mach number used in Fluid Mechanics.

A) √(Inertia force / Surface tension force)
B) √(Inertia force / Elastic force)
C) √(Inertia force / Pressure force)
D) √(Inertia force / Gravity force)

68) Which of the following shapes of camber is usually preferred for cement concrete pavements?

A) Straight line camber
B) Parabolic camber
C) Elliptic camber
D) Combination of straight and parabolic

69) The strain energy stored by the body within elastic limit, when loaded externally is called as:

A) Elastic Energy
B) Toughness
C) Resilience
D) Poison's Ratio

70) Which of the following refers to the number of vehicles passing at some given point in highway in a given time interval?

A) Traffic flow
B) Density
C) Traffic concentration
D) Speed flow

71) What is the condition for stable equilibrium of a floating body?
(where, M is meta-centre, B is centre of buoyancy and G is centre of gravity)

A) M lies above G
B) M lies below G
C) M and G coincide
D) B lies below G

72) The transverse members of the track placed below the rails to support and fix them in position, are termed as

A) Sleepers
B) Ballast
C) Wagon
D) Bolt

73) The Moment of Inertia of a rectangular section having width b and depth d, about a line passing through the base is

A) $bd^3 / 24$
B) $bd^3 / 3$
C) $bd^3 / 8$
D) $bd^3 / 5$

74) If the principal tensile stresses in a plane are 200 MPa and 50 MPa, what is the magnitude of maximum shear stress?

A) 70 MPa
B) 75 MPa
C) 60 MPa
D) 80 MPa

75) The type of layout of water supply distribution system that has only one main from which sub-mains and laterals branch off, and also most suitable for an irregularly grown city is

A) dead-end system
B) grid iron system
C) ring system
D) radial system

76) The section modulus (Z) of a hollow circular section with external diameter as D and internal diameter as d, is given by

A) $Z = \frac{\pi}{30D}[D^5 - d^4]$

B) $Z = \frac{\pi}{32D}[D^4 - d^4]$

C) $Z = \frac{\pi}{16D}[D^4 - d^4]$

D) $Z = \frac{\pi}{32D}[D^2 - d^2]$

77) Which of the following is an event oriented statistical tool used in project management?

A) PERT
B) CPM
C) RAM
D) ROM

78) An earthen dam is constructed on impermeable foundation, The coefficient of permeabilities of soil in horizontal and vertical direction are $5.2\times10^{-8}$ m/s and $1.2\times10^{-8}$ m/s. The water level on the reservoir side is 10 m from the base of the dam and number of flow channels is 4. The quantity of seepage per unit length in $m^3/s$ can be found using which of the following formulas?

A) $Q = \mathrm{H}.\frac{N_f}{kN_d}$

B) $Q = \mathrm{k}.3\mathrm{H}.\frac{N_d}{N_{df}}$

C) $Q = \mathrm{k}.\mathrm{H}.\frac{N_f}{N_d}$

D) $Q = \mathrm{k}.\frac{N_f}{HN_d}$

70 C

79) Find the relationship between degree of mixing and degree of turbulence in coagulation process.

A) Degree of mixing is equal to degree of turbulence
B) Degree of mixing is directly proportional to degree of turbulence
C) Degree of mixing is inversely proportional to degree of turbulence
D) Degree of mixing is not proportional to degree of turbulence

---

80) A cross drainage work, where canal is taken over by the drainage if the bed level of irrigation canal is higher than the drainage, is called as

A) Aqueduct
B) Aquifer
C) Aquifuge
D) Aquiclude

---

81) What is the relationship between void ratio (e) and porosity (n)?

A) (1-n )= (1+e)
B) n/(1+e) = 0
C) e = (n+1)/n
D) e = n / (1-n)

---

82) If the moment of resistance obtained from the compressive force is equal to moment of resistance obtained from the tensile force, then the R.C.C beam section will be a

A) Balanced Section
B) Prestressed Section
C) Under Reinforced Section
D) Over Reinforced Section

---

83) Find $T_e$ (in s), for an activity with $T_0$=4 s ,$T_m$=6 s and $T_p$=12 s.

A) 8.5
B) 7.4
C) 6.67
D) 5.33

---

84) For a standard 13 m rail, a sleeper density of M+4 would mean how many sleepers per rail length?

A) 9
B) 12
C) 13
D) 17

---

85) What is the width of broad gauge (in mm) as per Indian railways?

A) 1575 mm
B) 1676 mm
C) 1366 mm
D) 1456 mm

---

86) What involves the intelligent utilization of floats which can smoothen the demand of resources to the maximum possible extent?

A) Resource allocation
B) Resource smoothing
C) Resource levelling
D) Resource aggregation

---

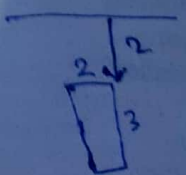
87) Which of the following options is NOT a function of inspection galleries provided generally in a Dam?

A) To drain the water seeping through the dam body
B) Provides space for drilling and grouting for the foundation
C) Gives access to the interior part of dam for controlling or maintainance purpose
D) Excess amount of water from the dam is treated for disinfection here

---

88) A rectangular plane surface that lies in a vertical plane in water is 2 m wide and 3 m deep. Find the Total pressure if the upper edge is horizontal and 2 m below the free water surface.

A) 106.01 kN
B) 406.01 kN
C) 206.01 kN
D) 306.01 kN



89) A neutral solution with pH value as 7, will have hydrogen ion concentration (in moles per litre), equal to

A) $10^{-5}$
B) $10^{-7}$
C) $10^{-6}$
D) $10^{-9}$

90) Which among the following is defined as the ratio of plasticity index to flow index?

A) Toughness index
B) Shrinkage ratio
C) Shrinkage limit
D) Consistency Index

91) In construction management, the increase in the direct cost to be spent on an activity in a day, is usually termed as:

A) Cost slope
B) Direct cost
C) Indirect cost
D) Crash cost

92) The spacing of sleepers for a railway track is usually calculated using which of the following formulas?

A) Spacing of Sleeper = (2 x Width of sleeper) + depth of ballast)
B) Spacing of Sleeper = Width of sleeper / (2 x depth of ballast)
C) Spacing of Sleeper = Width of sleeper + (2 x depth of ballast)
D) Spacing of Sleeper = Width of sleeper - (2 x depth of ballast)

$S = 2w + d$ $S = \frac{w}{2d}$, $S = w + 2d$ $S = w - 2d$

93) When an individual footing accommodates two or more than two columns, it is usually called as

A) Combined footing
B) Isolated footing
C) Strap footing
D) Pile foundation

$S = \frac{d - w}{2}$

94) The distance between metacentre and centre of gravity of floating body is called as

A) Metacentric height
B) Buoyancy
C) Centre of pressure
D) Buoyant height

95) What is generally done to remove pathogenic bacteria in drinking water?

A) Sedimentation
B) Disinfection
C) Flocculation
D) Coagulation

96) Which among the following does NOT consume any time/resources, in a network analysis of project management?

A) Activity
B) Slack
C) Dummy activity
D) Concurrent operations

97) PERT is a project management technique that is mainly useful for tasks involving uncertainities. What is the full form of PERT?

A) Project Evaluation and Review Technique
B) Programme Evaluation and Review Technique
C) Programme Elevation and Review Technique
D) Programme Evaluation and Revise Technique

98) Generally, in R.C.C sections for beams, the depth of the neutral axis usually determines the type of section. For an over reinforced section, the actual neutral axis lies:

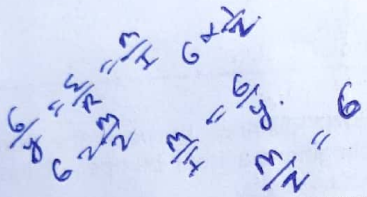
A) Along the top fibre of the section
B) Above the critical neutral axis
C) Below the critical neutral axis
D) In the same line along the critical neutral axis

99) What is the amount of time that a task can be delayed without affecting the subsequent tasks?

A) Part Float
B) Node Point
C) Free Float
D) Total float

100) The net quantity of one bag of cement according to BIS standards is

A) 50 kg
B) 40 kg
C) 30 kg
D) 20 kg



101) For a given section, how does the section modulus usually affect the strength of bending (stress)?

A) If section modulus is small, then stress will be more
B) Section modulus is independent of stress
C) Section modulus is inversely proportional to stress
D) Section modulus is always Zero for any given section

102) There are few sight distances considered in the geometric design of pavements for safety purposes to avoid any accidents. In this regards, the equation

$$vt + \frac{v^2}{2gf}$$

refers to which of the following options?

Given Data: v is the design speed in m / sec², t is the reaction time in sec, g is the acceleration due to gravity and f is the coefficient of friction.)

(Symbols and notations carry their usual meaning)

A) Intermediate Sight Distance
B) Overtaking Sight Distance
C) Stopping Sight Distance
D) Head light Sight Distance

103) The tension or flexure cracks in a R.C.C beam usually develop in which of the following ways?

A) In circular patterns
B) In a vertical direction
C) In a horizontal straight line for half the length of the beam
D) Initially in a horizontal straight line and then inclined towards the top of the beam

104) What is the ratio of longer dimension to shorter dimension in a one way slab?

A) equal or greater than 2
B) equal to 1
C) less than 2
D) less than 1.5

105) As per IS:456-2000, the side face reinforcement should be provided along the two faces of a beam, when the depth of the web in a beam exceeds

A) 350 mm
B) 550 mm
C) 650 mm
D) 750 mm

106) What is the approximate modular ratio for M30 grade concrete? (given : $\sigma_{cbc}$ = permissible compressive stress in concrete in bending = 10 N/mm², as per working stress method of IS 456:2000)

A) 3.9
B) 9.33
C) 5.22
D) 6.1

107) The boundary between the carriage way and the shoulder or islands or footpaths of a pavement is known as

A) Kerb
B) Camber
C) Bus-bay
D) Right of Way

108) The sum of the hammer blows required for the second and third 15 cm of penetration in standard penetration test is taken as

A) Seating penetration
B) Submergence
C) Overburden pressure (P)
D) Penetration resistance (N)

109) The radius of the horizontal curve (R), for a design speed of (V) 100 kmph with the maximum values of (superelevation) e = 0.07 and (coefficient of friction) f = 0.15, can be calculated using which of the following equations?

A) $e + f = \frac{V^3}{137\,R}$

B) $e + f = \frac{V^2}{127\,R}$

C) $e + f = \frac{V^2}{12\,R}$

D) $e + f = \frac{V^3}{127\,R}$

110) Which irrigation projects should usually have cultivable command area of more than 10,000 ha out of which 2000 ha utilises surface water resources?

A) Major
B) Medium
C) Minor
D) Ground

111) The location of neutral axis of a T-beam, will fall in which of the following categories?

(a)Within the flange,
(b) Outside the flange ,
(c ) Always atthe centre of the web of beam

A) Only a
B) Only b
C) Both a and b
D) Only c

112) The distance between the front bumper of leading vehicle and the front bumper of the following vehicle, is known as

A) Spacing
B) Traffic density
C) Sight distance
D) Traffic volume

113) What is the value of the ratio between maximum shear stress to average shear stress for a circular section?

A) 4/3
B) 1/8
C) 2/3
D) 5/5

114) Which among the following, is the longest sequence of activities that must be finished on time in order for the entire project to be complete?

A) Dummy Path
B) Event
C) Critical Path
D) Non Critical Path

115) Which method of irrigation is usually suitable for orchard trees?

A) Border strip
B) Sprinkler
C) Basin
D) Furrow

116) What is the maximum daily water demand where 'Q' is Annual average daily demand?

A) 1.2 Q
B) 3.2 Q
C) 2.6 Q
D) 1.8 Q

117) Select the CORRECT symbol used in soil mechanics as per standard codal procedures for well graded soil.

A) GM
B) GW
C) GC
D) SP

118) What are the small diameter pipes filled with outlets in drip irrigation methods called?

A) Emitters
B) Conveyors
C) Sprinklers
D) Barrage

119) Read the following statements and choose the CORRECT option.

(i) The plate load test, is used to determine the bearing capacity and settlement of soil and may be carried out by either using a gravity loading or truss loading method.

(ii) As the width of the bearing plate used in the plate load test is very small compared with the actual foundation, it usually only provides an estimate of the bearing capacity up to a depth of twice the width of the bearing plate.

A) (i) is TRUE and (ii) is TRUE
B) (i) is TRUE and (ii) is FALSE
C) (i) is FALSE and (ii) is TRUE
D) (i) is FALSE and (ii) is FALSE

120) In Indian Railways, the standard length of rails recommended for Meter Gauge (MG) is

A) 12 m
B) 22 m
C) 32 m
D) 42 m