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POLYTECHNIC TRB

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PART-A

1. The trace and determinant of a 2 × 2 matrix are known to be -2 and -35 respectively, its eigen values are :

A) -30 and -5

B) -37 and -1

C) -7 and 5 - **(Correct Answer)**

D) 17.5 and -2

2. Which of the following describes the relationship among the three vectors $\hat{\imath} + \hat{\jmath} + \hat{k}, 2\hat{\imath} + 3\hat{\jmath} + \hat{k}$ and $\hat{\imath} + 6\hat{\jmath} + 4\hat{k}$?

A) The vectors are linearly dependent - **(Correct Answer)**

B) The vectors are linearly independent

C) The vectors are mutually perpendicular

D) The vectors are unit vectors

3. A function $f(x) = 1 - x^2 + x^3$ is defined in the closed interval $[-1, 1]$, the value of x , in the open interval $(-1, 1)$ for which the mean value theorem is satisfied is :

A) $\frac{-1}{3}$- **(Correct Answer)**

B) $\frac{-1}{2}$

C) -3

D) $\frac{1}{3}$

4. Given $y'' + 2y' + y = 0, y(0) = 0, y(1) = 0$, what is $y(0.5)$?

A) 0 - **(Correct Answer)**

B) 1

C) 2

D) 0.5

5. The solution for the differential equation

$x'(t) + 2x(t) = \delta(t)$ with initial condition $x(0) = 0$ is :

A) $e^{-2t}u(t)$ - **(Correct Answer)**

B) $e^{+2t}u(t)$

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C) $e^{-t}u(t)$

D) $e^{t}u(t)$

6. If $f(z) = c_0 + c_1 z^{-1}$ then $\oint_{\text{unit circle}} \frac{1+f(z)}{z} dz$ is given by :

A) $2\pi(1 + c_0)$

B) $2\pi i(1 + c_0)$ - **(Correct Answer)**

C) $2\pi c_1$

D) $2\pi i c_1$

7. Which of the following is not Dirichlet's condition ?

A) f(x) should be periodic

B) f(x) should have infinite number of discontinuities in any one period - **(Correct Answer)**

C) f(x) should have a finite number of maxima and minima

D) f(x) should be single valued and finite

8. A box contains 4 red and 6 green balls. Two are drawn out from the box at a time. One of them is selected and found to be red, what is the probability that the other one is also red ?

A) $\frac{1}{3}$ - **(Correct Answer)**

B) 1/2

C) 1/9

D) $\frac{5}{9}$

9. The estimate of $\int_{0.5}^{1.5} \frac{dx}{x}$ obtained using Simpson's rule with three point function evaluation exceeds the exact value of 1.0986 by ___ .

A) 1.111

B) 2.222

C) 0.088

D) 0.012 - **(Correct Answer)**

10. Gauss-Seidal method is used to solve the following equations : $x_1 + 2x_2 + 3x_3 = 5; 2x_1 + 3x_2 + x_3 = 13x_1 + 2x_2 + x_3 = 3$ Assuming initial guess as $x_2 = x_3 = 0$, the value of x_3 after 1st iteration is :

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A) $\frac{14}{9}$ - **(Correct Answer)**

B) 1

C) $\frac{-1}{3}$

D) $\frac{12}{9}$

11. In case of biaxial stresses, the maximum value of shear stress is :

A) Difference between the normal stresses

B) Half the difference of normal stresses - **(Correct Answer)**

C) Sum of the normal stresses

D) Half the sum of the normal stresses

12. Second moment of area about an axis normal to the area is termed as :

A) Moment of inertia

B) Polar moment of inertia - **(Correct Answer)**

C) Principal moment of inertia

D) Mass moment of inertia

13. Two trains A and B are travelling on two straight and parallel tracks with velocities of 100 km/hr and 80 km/hr respectively. The relative velocity of train A with respect to train B moving in the same direction is :

A) 180 km/hr

B) 90 km/hr

C) 60 km/hr

D) 20 km/hr - **(Correct Answer)**

14. Variation of bending moment in a cantilever carrying gradually varying load whose intensity varies uniformly from zero at the free end to 'w' per unit run at the fixed end is :

A) Cubic - **(Correct Answer)**

B) Parabolic

C) Linear

D) Hyperbolic

15. At the neutral axis of a beam bending stress is :

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A) Maximum

B) Zero - **(Correct Answer)**

C) Tensile

D) Compressive

16. ___ occurs when the bending moment do not act in a plane of symmetry of the member.

A) Unsymmetrical bending - **(Correct Answer)**

B) Symmetrical bending

C) Curved bending

D) Simple bending

17. In a thick walled cylinder subjected to internal pressure, maximum hoop stress occurs at :

A) Outer wall

B) Inner wall - **(Correct Answer)**

C) Mid point of thickness

D) Inbetween inner and outer wall

18. Leaf springs are subjected to :

A) Tensile stress

B) Compressive stress

C) Bending stress - **(Correct Answer)**

D) Shear stress

19. For no tension to occur in the solid circular column, the limiting value of eccentricity is :

A) d/8 - **(Correct Answer)**

B) d/6

C) d/4

D) d/2

20. When both ends of the column are fixed, the crippling load is :

A) $\frac{\pi^2 EI}{4l^2}$

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B) $\frac{\pi^2 EI}{l^2}$

C) $\frac{2\pi^2 EI}{l^2}$

D) $\frac{4\pi^2 EI}{l^2}$ - **(Correct Answer)**

21. A three-hinged semicircular arch of radius R carries a uniformly distributed load of intensity WkN/m over the entire span. Find the position (x) of maximum positive and negative bending from the left span.

A) $x = \frac{L}{4}; \frac{3L}{4} -$ **(Correct Answer)**

B) $x = \frac{L}{2}$

C) $x = \frac{2L}{3}; \frac{3L}{2}$

D) $x = \frac{L}{3}$

22. When the maximum bending moment is obtained at a section in simply supported beam subjected to moving uniformly distributed load shorter than span :

A) Load reaches the section

B) Load leaves the section

C) Load occupies the centre of span

D) When the section divides the load and span in the same ratio - **(Correct Answer)**

23. In the stiffness method, the primary unknown is ___ .

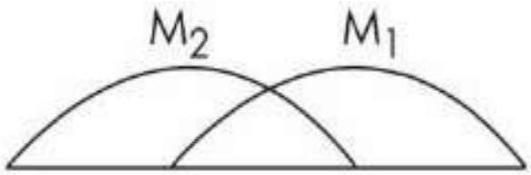
A) Displacement - **(Correct Answer)**

B) Force

C) Both Displacement and Force

D) Neither displacement nor Force

24. The given influence line diagram belongs to :



A) The bending moment diagram due to single concentrated load moving on simply supported beam.

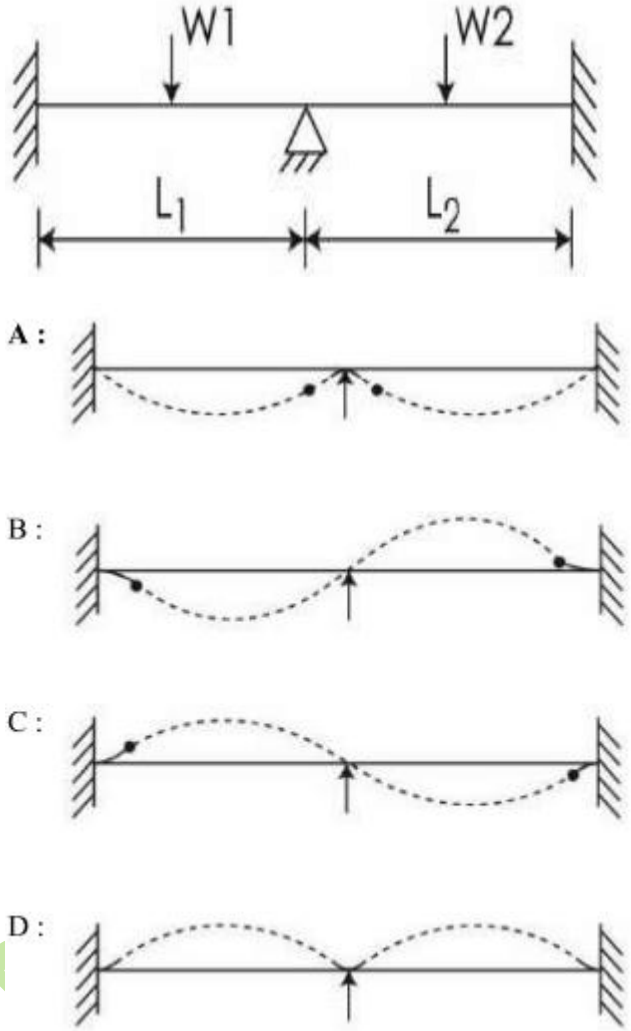
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B) The bending moment diagram due to two concentrated loads separated by a distance 'd' moving on simply supported beam. - **(Correct Answer)**

C) The bending moment diagram due to UDL longer than span moving on simply supported beam.

D) The bending moment diagram due to UDL shorter than span moving on simply supported beam.

25. The deflected shape of the given beam is :



26. The slope deflection equation for final moment of beam(AB) hinged at ends A and B.

A) $M_{AB} = M_{FAB} + \frac{4EI}{L}\left(2\theta_A + \theta_B \pm \frac{3\delta}{L}\right)$

B) $M_{AB} = M_{FAB} - \frac{4EI}{L}\left(2\theta_A + \theta_B \pm \frac{3\delta}{L}\right)$

C) $M_{AB} = M_{FAB} + \frac{2EI}{L}\left(2\theta_A + \theta_B \pm \frac{3\delta}{L}\right)$ –(Correct Answer)

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D) $M_{AB} = M_{FAB} - \frac{2EI}{L}\left(2\theta_A + \theta_B \pm \frac{3\delta}{L}\right)$

27. The shape of cable under its self weight is :

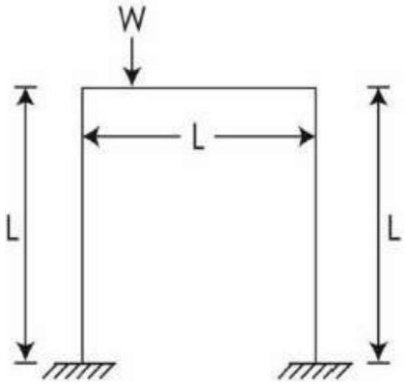
A) Parabola

B) Funicular polygon

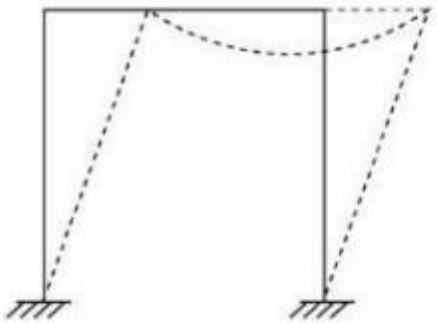
C) Circular

D) Catenary - **(Correct Answer)**

28. The deflected shape of portal frame shown in figure is :

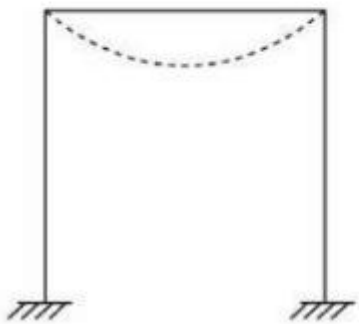


A :



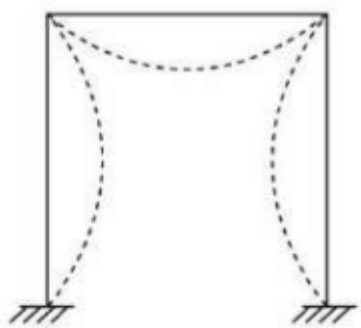
– (Correct Alternative)

B :

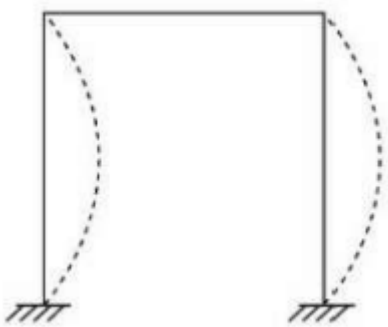


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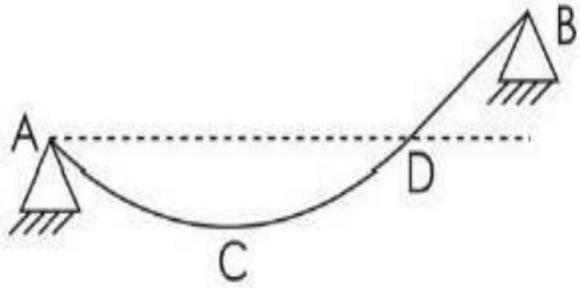
C :



D :



29. The minimum tension in the given cable is obtained at :



A) A

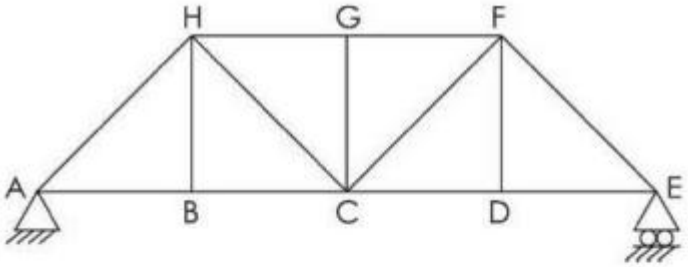
B) B

C) C - **(Correct Answer)**

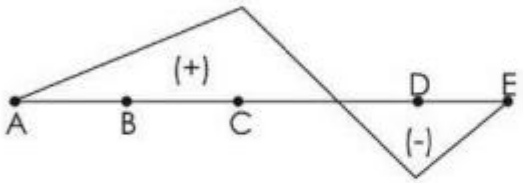
D) Both A and B

30. The shape of influence line diagram for force in the member CH of the truss shown in figure :

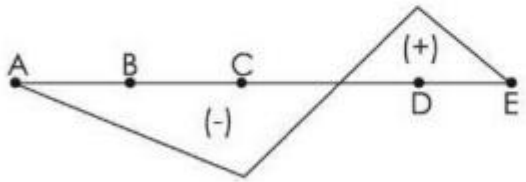
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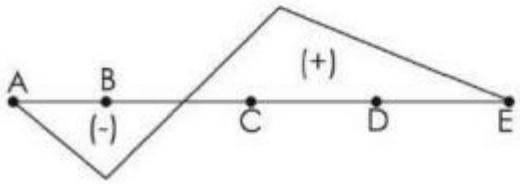
A :



B :

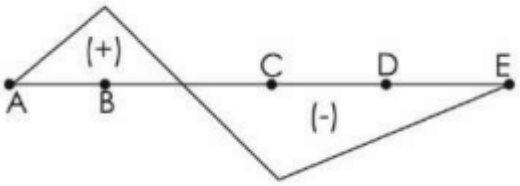


C :



– (Correct Alternative)

D :



31. The modulus of elasticity of concrete of grade μ_{25} is ___ (as per IS : 456-2000)

A) 1000 N/mm^2

B) 25000 N/mm^2 - **(Correct Answer)**

C) 125000 N/mm^2

D) 250000 N/mm^2

32. Basic L/D ratio for cantilever beams is given in IS : 456-2000 as :

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A) 10

B) 20

C) 8

D) 7 - **(Correct Answer)**

33. The maximum spacing of an inclined stirrups is ___ .

A) 0.5 d on 300 mm, whichever is less.

B) 0.75 d on 300 mm, whichever is less.

C) 1.0 d or 300 mm, whichever is less. - **(Correct Answer)**

D) 1.2 d on 300 mm, whichever is more.

34. The minimum numbers of bars required in rectangular and circular columns are ___ .

A) 4 and 6 - **(Correct Answer)**

B) 6 and 6

C) 8 and 6

D) 6 and 8

35. When the Retaining wall tends to moves towards the soil, the soil mass is compressed and develop ___ .

A) Active earth pressure

B) Passive earth pressure - **(Correct Answer)**

C) Neutral pressure

D) Both neutral and passive pressure

36. In retaining wall ___ is provided below the stem to make it safe against sliding.

A) Counter fort

B) Shear key - **(Correct Answer)**

C) Heel

D) Toe

37. In prestressed concrete design, the section for flexure is designed by ___ .

A) Equilibrium Method

B) Virtual Work Method

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C) Yield Line Method

D) Magnel's Method - **(Correct Answer)**

38. If the frequency of excitation coincides with one of the natural frequencies of the system, a condition of ___ is encountered in

A) Harmonic

B) Periodic vibration

C) Resonance - **(Correct Answer)**

D) Ideal

39. The natural frequency of single degree of freedom system of free vibration is given by ___ .

A) $f_n = 2\pi\sqrt{\frac{m}{k}}$

B) $f_n = \frac{1}{2\pi}\sqrt{K/m}$ – **(Correct Answer)**

C) $f_n = 2\pi\sqrt{K/m}$

D) $f_n = \frac{1}{2\pi}\sqrt{m/K}$

40. The effective length of a column effectively held in position and restrained against rotation in one end and partially against restrained rotation but not held in position at the other end is ___ .

A) 1.0 L

B) 2.0 L

C) 1.2 L

D) 1.5 L - **(Correct Answer)**

41. The distance at right angles to the direction of stress from the centre of the hole to the adjacent edge is :

A) Pitch

B) Edge distance - **(Correct Answer)**

C) Grip length

D) Clear distance

42. The mode of failure in a fillet weld material is :

A) Tension

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B) Bearing

C) Shear - **(Correct Answer)**

D) Crushing

43. Which of the following section is poor in torsion ?

A) Circular hollow section

B) Square hollow section

C) Rectangular hollow section

D) Tee section - **(Correct Answer)**

44. The maximum slenderness ratio of a member carrying compressive load resulting from dead loads and imposed load is :

A) 180 - **(Correct Answer)**

B) 250

C) 300

D) 400

45. In column, when one rolled section cannot provide the needed large radius of gyration which section will be used ?

A) I section

B) C section

C) Tubular section

D) Built-up section - **(Correct Answer)**

46. The ratio between plastic moment of resistance to yield moment of resistance of section is called as :

A) Section modulus

B) Shape factor - **(Correct Answer)**

C) Ductility factor

D) Stress reduction factor

47. In beams, at the point of concentrated load (or) at the point of support reaction, the fold developed in the web of the beam at the place close to the flange is calleD)

A) Web buckling

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B) Web stiffening

C) Web crippling - **(Correct Answer)**

D) Distortional buckling

48. Cross-section which can form plastic moment of resistance but inadequate plastic hinge rotation capacity to develop plastic mechanism due to local buckling are categorized as ___ sections.

A) Slender

B) Semi-compact

C) Plastic

D) Compact - **(Correct Answer)**

49. Intermediate vertical stiffeners are provided in plate girders to :

A) Eliminate web buckling - **(Correct Answer)**

B) Eliminate local buckling

C) Transfer concentrated loads

D) Prevent excessive deflection

50. The ratio of the rise to the span is calleD)

A) Pitch - **(Correct Answer)**

B) Ridge

C) Panel

D) Chord

51. As per ISCS classification system the soils are broadly divided into :

A) Coarse grained soil, Fine grained soil

B) Coarse grained soil, Fine grained soil, Highly organic soils and other miscellaneous soil materials - **(Correct Answer)**

C) Coarse grained soil, Highly organic soils and other miscellaneous soil materials

D) Highly organic soils and other miscellaneous soil materials, Fine grained soils

52. The pneumatic tyred rollers is suitable for compacting :

A) Cohesionless and cohesive soils - **(Correct Answer)**

B) Cohesive soils

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C) Cohesionless soils

D) Highly organic soils

53. In which tests the soil specimen is subjected to direct stresses acting in three mutually perpendicular directions.

A) Direct Shear Test

B) Triaxial Compression Test - **(Correct Answer)**

C) Vane Shear Test

D) Unconfined Compression Test

54. Effective Stress in a soil is :

A) Effective Stress = Total stress due to loading + pore water pressure

B) Effective Stress = Total stress due to loading x pore water pressure

C) Effective stress $= \frac{\text{Total stress due to loading}}{\text{Pore water pressure}}$

D) Effective stress = Total stress due to loading - pore water pressure - **(Correct Answer)**

55. The ISCS is essentially based on :

A) Textural classification

B) HRB classification

C) USCS - **(Correct Answer)**

D) AASHTO classification

56. If void ratio is 0.5 , the porosity of the soil is :

A) 0.5

B) 0.666

C) 1

D) 0.333 - **(Correct Answer)**

57. According to Darcy's Law for flow through porous media, the velocity is proportional to :

A) Effective Stress

B) Cohesion

C) Hydraulic gradient - **(Correct Answer)**

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D) Stability number

58. The stress which controls the strength and deformation behaviour of soil is :

A) Total pressure

B) Pore water pressure

C) Effective pressure - **(Correct Answer)**

D) Capillary pressure

59. The CBR values are usually calculated for penetrations of :

A) 2.5 mm and 5 mm - **(Correct Answer)**

B) 5 mm

C) 2.5 mm

D) 10 mm

60. Which of the following soil is formed by wind ?

A) Talus

B) Loess - **(Correct Answer)**

C) Drift

D) Marl

61. Which one of the following method is adopted for drilling bore hole in rocky strata ?

A) Wash boring

B) Hand auger

C) Percussion drilling - **(Correct Answer)**

D) Mechanical auger

62. The soil sampler used to collect undisturbed sample in soft clay is :

A) split-spoon sampler

B) thin walled sampler

C) scraper bucket sampler

D) piston sampler - **(Correct Answer)**

63. The height of fall of the SPT hammer is :

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A) 750 mm - **(Correct Answer)**

B) 600 mm

C) 650 mm

D) 800 mm

64. The minimum diameter of test plate used in plate load test is :

A) 450 mm

B) 300 mm - **(Correct Answer)**

C) 600 mm

D) 750 mm

65. The value of coefficient of active earth pressure for pure clay is :

A) 0

B) 3

C) $\frac{1}{3}$

D) 1 - **(Correct Answer)**

66. The maximum and minimum values of water table correction factors respectively are :

A) 0.5 and 0

B) 1 and 0.75

C) 1 and 0.5 - **(Correct Answer)**

D) 1 and 0

67. As per Indian code of practice, the minimum depth of foundation in soil, is :

A) 1.0 m

B) 0.5 m - **(Correct Answer)**

C) 1.5 m

D) 0.75 m

68. An isobar is a curve joining points of equal :

A) vertical stress - **(Correct Answer)**

B) horizontal stress

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C) maximum vertical stress

D) zero vertical stress

69. As per Indian code of practice, the maximum permissible settlement for isolated footing in sand, is :

A) 40 mm - **(Correct Answer)**

B) 65 mm

C) 50 mm - **(Correct Answer)**

D) 25 mm

70. The maximum value of adhesion factor for very soft clay is :

A) 1 - **(Correct Answer)**

B) 0.3

C) 0.7

D) 0

71. If the annual stream flow from a 20 km^2 catchment is 10^7 m^3, it corresponds to a depth of :

A) 100 cm

B) 75 cm

C) 60 cm

D) 50 cm - **(Correct Answer)**

72. The basic assumptions of unit hydrograph theory are :

A) non linear response

B) time invariance and linear response - **(Correct Answer)**

C) linear response and linear time variance

D) non linear time variance and linear response

73. An ideal fluid is :

A) highly viscous

B) frictionless and compressible

C) one which obeys Newton's law of viscosity

D) one which is incompressible and has zero viscosity - **(Correct Answer)**

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74. The printer's ink is an example of :

A) Newtonian Fluid

B) Non-Newtonian Fluid

C) Thyxotropic substance - **(Correct Answer)**

D) Elastic solid

75. ___ is the ratio of Inertia force to the viscous force.

A) Froude's number

B) Reynolds number - **(Correct Answer)**

C) Mach number

D) Euler number

76. Darcy-Weisbach equation is used to determine the loss of head due to :

A) Friction - **(Correct Answer)**

B) Sudden enlargement

C) Sudden contraction

D) Obstruction

77. For maximum efficiency of a series of curved varies, its velocity is :

A) equal to velocity of Jet

B) $\frac{3}{4}$ of velocity of Jet

C) $\frac{1}{2}$ of velocity of Jet - **(Correct Answer)**

D) $\frac{1}{3}$ of velocity of Jet

78. The specific speed of a pump is expressed as :

A) $\left[\frac{N\sqrt{Q}}{H}\right]$

B) $\left[\frac{N\sqrt{Q}}{H^2}\right]$

C) $\left[\frac{N\sqrt{Q}}{H^{3/4}}\right]$ - **(Correct Answer)**

D) $\left[\frac{N\sqrt{Q}}{H^{5/4}}\right]$

79. The boundary layer exists due to :

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A) Surface Tension

B) Gravitational effect

C) Viscosity of fluid - **(Correct Answer)**

D) Pressure

80. The most essential condition for formation of hydraulic Jump is :

A) the constant specific energy

B) the existence of supercritical flow before the jump - **(Correct Answer)**

C) the existence of subcritical flow before the jump

D) the existence of critical flow before the jump

81. In the plot between time versus BOD, second stage BOD is due to :

A) Experimental error

B) Increased activity of bacteria

C) Interference by certain chemical reactions

D) Nitrification demand - **(Correct Answer)**

82. Which of the following size range of solids can be removed by coagulation ?

A) 10^{-8} to 10^{-6} mm

B) 10^{-6} to 10^{-2} mm - **(Correct Answer)**

C) 10^{-2} to 10^{-1} mm

D) 10^{-1} to 10^{0} mm

83. Which of the following is used for both velocity control device and flow control device ?

A) Proportional flow weir

B) Parshall flume - **(Correct Answer)**

C) Venturi meter

D) Orifice meter

84. Among them which of the following process, nitrate nitrogen is used as electron acceptor :

A) Aerobic process

B) Anaerobic process

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C) Anoxic process - **(Correct Answer)**

D) Facultative process

85. In activated sludge process, which of following equation is valiD)

Where

Q = influent sewage flow rate

Q_r = returned sludge flow rate

x = concentration of MLSS in aeration tank

x_r = concentration of MLSS in returned sludge

A) $\frac{Q_r}{Q} = \frac{x}{x_r - x}$ – (**Correct Alternative**)

B) $Q_r x = Q(x_r - x)$

C) $\frac{Q_r}{1+Q} = \frac{x}{x_r + x}$

D) $\frac{1+Q}{Q_r} = \frac{x}{x_r + x}$

86. To determine efficiency of High Rate Trickling filter which of the following equation cannot be used ?

A) Velz equation

B) Eckenfelder equation

C) Galler and Gotaas equation

D) Udo wisemann equation - **(Correct Answer)**

87. A grit chamber of dimension 12 m × 1.50 m × 0.80 m liquid depth at a flow of 0 m^3/h. It's surface loading rate is :

A) 400 lph /m^2

B) 4000 lph/m^2

C) 40000lph/m^2 - **(Correct Answer)**

D) 60000 lph/m2

88. Percentage of chlorine in fresh bleaching powder is about :

A) 10-15

B) 20-25

C) 30-35 - **(Correct Answer)**

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D) 50-60

89. To remove magnesium chloride from water which of the following method is useD)

A) use of lime only

B) use of soda only

C) use of both lime and soda - **(Correct Answer)**

D) use of boiling

90. If 0.8% solids from sludge is thickened to 4% solids, then decrease in volume of sludge would be how many times from initial volume of sludge.

A) 2 times

B) 3 times

C) 4 times

D) 5 times - **(Correct Answer)**

91. In an old map, a line AB was drawn to a magnetic bearing of 8°30′. The magnetic declination at the time being 2° East. To what magnetic bearing should the line be set how of the present magnetic declination is 8°30' East.

A) 2° (Anticlockwise direction)

B) 2° (Clockwise direction) - **(Correct Answer)**

C) 358° (Clockwise direction)

D) 0º

92. Two parallel lines are to be connected. What type of curve would you suggest ?

A) Reverse Curve - **(Correct Answer)**

B) Compound Curve

C) Lemniscate Curve

D) Simple Curve

93. PSI stands :

A) Pavement Serviceability Index

B) Permanent Serviceability Index

C) Pavement Service Index

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D) Present Serviceability Index - **(Correct Answer)**

94. The allowable Centrifugal Ratio for Railways is :

A) $\frac{1}{6}$

B) $\frac{1}{4}$

C) $\frac{1}{8}$ – **(Correct Answer)**

D) $\frac{1}{10}$

95. Find the Radius of curvature of the bubble tube if the length of one division is 2 mm and if the angular value of one division is 1 minute.

A) 6.87 m - **(Correct Answer)**

B) 0.033 m

C) 687 m

D) 68.7 m

96. The maximum length of offset is limited to :

A) 3 m

B) 30 m

C) 15 m - **(Correct Answer)**

D) 20 m

97. Which one of the following Indian Standard is used to find the softening point of Bitumen ?

A) IS 1206 - Part 2

B) IS 1206 - Part 3

C) IS 1203

D) IS 1205 - **(Correct Answer)**

98. A Vehicle moving at 60 kmph on a bituminous dry surface is suddenly brought to rest by braking. The co-efficient can be assumed to be 0.5. Calculate the distance over which the vehicles comes to a stop :

A) 30.12 m

B) 28.3 m - **(Correct Answer)**

C) 2.83 m

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D) 0.3 km

99. If q be the angle of slope and 1 be the sloping distance the correction for slope is given by ___ .

A) $1(1-\cos\theta)$ (Negative) - **(Correct Answer)**

B) $1(\cos\theta-1)$ (Negative)

C) $1(1-\cos\theta)$ (Positive)

D) $1(\cos\theta-1)$ (Positive)

100. The application of a bituminous binder to an existing surface to ensure a bond is called as ___ .

A) Prime coat

B) Seat coat

C) Surface Pressing

D) Tack coat - **(Correct Answer)**

101. If the area of an equilateral triangle is $\sqrt{3}$sq. cm. Find the length of its sides.

A) 3 cm

B) 1 cm

C) 2 cm - **(Correct Answer)**

D) 4 cm

102. Which year the mint of Chintadripet was established by the British Administration ?

A) 1665

B) 1697

C) 1732

D) 1742 - **(Correct Answer)**

103. Prince of Wales arrived at Madras on :

A) 10^{th} January, 1922

B) 11^{th} January, 1922

C) 12^{th} January, 1922

D) 13^{th} January, 1922 - **(Correct Answer)**

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104. Solution of which dye is used for sterilizing skin and in gynaecological practice ?

A) Malachite green

B) Crystal violet - **(Correct Answer)**

C) Martius yellow

D) Congo red

105. The first product synthesized during Calvin cycle is ___ .

A) Malic acid

B) Phosphoglyceric acid - **(Correct Answer)**

C) Glycolate

D) Aspartic acid

106. Myopia, Colourblindness and Juvenile glaucoma are the examples of :

A) X-linked genes - **(Correct Answer)**

B) Y-linked genes

C) XY-linked genes

D) Sex-limited genes

107. When did the Indian National Anthem sung at first ?

A) 21 December 1911

B) 23 December 1911

C) 25 December 1911

D) 27 December 1911 - **(Correct Answer)**

108. Annamalai University was formed in the year :

A) 1922

B) 1924

C) 1926

D) 1928

Correct Answer:-*

109. Which of the following is not a metamorphic rock ?

A) Marbles

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B) Slate

C) Granite - **(Correct Answer)**

D) Schist

110. Who was the Founder of the Madurai Tamil Sangam in 1901 ?

A) Kanaga Sabai

B) Pandithurai Thevar - **(Correct Answer)**

C) Saminatha Iyer

D) Krishnasamy Sharma

PART-B

1. The length of the curve $y = \frac{2}{3}x^{\frac{3}{2}}$ between $x = 0$ and $x = 1$ is:

A) 0.27

B) 0.67

C) 1.22 - **(Correct Answer)**

D) 1

2. The solution of the differential equation $\frac{dy}{dx} + \frac{y}{x} = x$ is, $(1) = 1$:

A) $y = \frac{2}{3}x^2 + \frac{1}{3}x$

B) $y = \frac{x^2}{3} + \frac{2}{3x}$ –(Correct Answer)

C) $y = \frac{5}{3}x^2 - \frac{2}{3}$

D) $\frac{x^2}{3} - \frac{2}{3}x$

3. The value of the contour integral $\oint_{|z-i|=2} \frac{dz}{z^2+4}$:

A) $\frac{\pi i}{2}$

B) $-\frac{\pi}{2}$

C $-\frac{\pi i}{2}$

D) $\frac{\pi}{2}$ - **(Correct Answer)**

4. A city installs 2000 electric lamps for street lighting. These lamps have a

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mean burning life of 1000 hours with a standard deviation of 200 hours. What is the probability that a lamp will fail in the first 700 hours. Given $\Phi(1.5) = 0.0668$

A) 0.0668

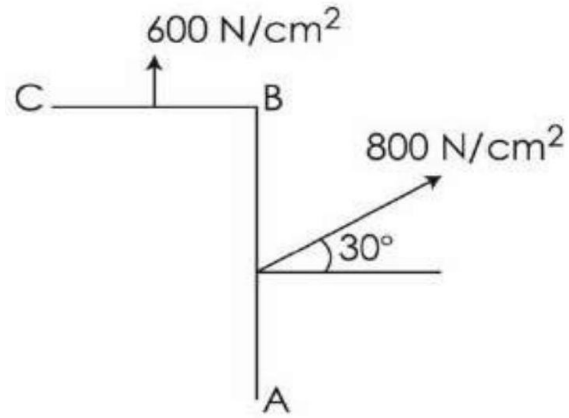
B) 0.9332

C) -0.0668

D) 0.0322

Correct Answer:-*

5. The Intensity of resultant stress on a plane AB at a point in a material under stress is 800 N/cm^2 and it is inclined at 30° to the normal to that plane. The normal stress on another plane BC at right angles to plane AB is 0 N/cm^2. Find the resultant stress on the plane BC.



A) 821 N/cm^2

B) 721 N/cm^2 - **(Correct Answer)**

C) 621 N/cm^2

D) 521 N/cm^2

6. A steel plate of width 120mm and of thickness 20mm is bent into a circular are radius 10m. Determine the maximum stress induced and E = 2x10^5 N/mm^2

A) 200 N/mm^2

B) 100 N/mm^2

C) 50 N/mm^2

D) 300 N/mm^2

7. A vessel in the shape of a spherical shell of 1.20 m internal diameter and 12 mm shell thickness is subjected to pressure of .6 N/mm^2. Determine the stress

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induced in the material of the vessel.

A) 40 N/mm^2 - **(Correct Answer)**

B) 20 N/mm^2

C) 30 N/mm^2

D) 50 N/mm^2

8. A metal pipe of 1 m diameter contains a fluid having a pressure of 100 N/ cm ^{2}. If the permissible tensile stress in the metal is 2 kN/ cm^2. The thickness of the metal required for making the pipe would be :

A) 25 mm - **(Correct Answer)**

B) 20 mm

C) 15 mm

D) 10 mm

9. Match the following :

(a) Slope deflection method	(i) Force method
(b) Moment distribution method	(ii) Displacement method
(c) Method of three moments	
(d) Castigliano's second theorem	

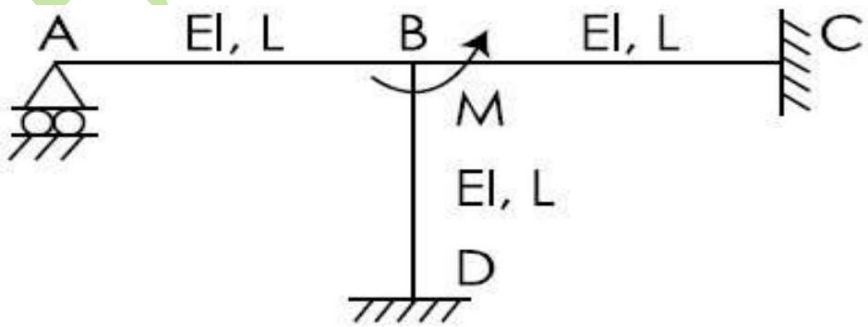
A) (a) - (i), (b) - (ii), (c) - (i), (d) - (ii)

B) (a) - (i), (b) - (i), (c) - (ii), (d) - (ii)

C) (a) - (ii), (b) - (ii), (c) - (i), (d) - (i) - **(Correct Answer)**

D) (a) - (ii), (b) - (i), (c) - (ii), (d) - (i)

10. Find the rotation of joint B of given frame. All the members of the frame have same flexural rigidity.



A) $\frac{ML}{12EI}$

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B) $\frac{ML}{11EI}$ - **(Correct Answer)**

C) $\frac{ML}{8EI}$

D) $\frac{ML}{7EI}$

11. Match the List - I with List - II : List – I

a) Method joint	i) $\Sigma fx = 0, \Sigma fy = 0$
b) Method of section	ii) $\Sigma fx = 0, \Sigma fy = 0, \Sigma M = 0$
c) Perfect frame	iii) $n > 2j - 3$
d) Redundant frame	iv) $n = 2j - 3$

A) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)

B) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)

C) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)

D) (a) - (i), (b) - (ii), (c) - (iv), (d) - (iii) - **(Correct Answer)**

12. Find the length of cable having span 16 m and dip of 3 m.

A) 17.5 m - **(Correct Answer)**

B) 18.5 m

C) 19.5 m

D) 20.5 m

13. M20 grade concrete and Fe 415 grade steel is used in a flexural RCC beam. The development length required for a bar of 20 mm diameter is :

A) 740 mm

B) 940 mm - **(Correct Answer)**

C) 1080 mm

D) 1480 mm

14. In a dog legged staircase, the waist slab has horizontal span of 4 m and vertical rise of 3 m. The overall depth of slab is 150 mm. The unit weight of concrete is $25 kN/m^3$. The self weight of the slab is :

A) $4.69 kN/m^2$ - **(Correct Answer)**

B) $6.25 kN/m^2$

C) $4.22 kN/m^2$

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D) $5.00 kN/m^2$

15. Which of the following statements are correct ?

(i) In a simply supported prestressed concrete beam the concentric tendons induces uniform axial compressive stress.

(ii) In a simply supported prestressed concrete beam subjected to only pre-stressing force the pressure line does not coincides with cable line.

(iii) Eccentric tendons in a simply supported prestressed concrete beam induces axial stress and bending stress.

(iv) In a simply supported prestressed concrete beam the uniformly distributed load can be counter balanced by Selecting a parabolic cable profile.

A) (i),(iii) & (iv) - **(Correct Answer)**

B) (i),(ii)& (iii)

C) (i), (ii), (iii) & (iv)

D) (ii), (iii) & (iv)

16. A building is situated in seismic zone III. The building is a lifeline structure. The building is made of ordinary moment resisting frame. The (sa/g) is 2.

The horizontal seismic acceleration coefficient is :

A) 0.05

B) 0.12

C) 0.18

D) 0.10

Correct Answer:-*

17. Which one of the following statement is incorrect ?

(i) Shear lag phenomenon is prominent in the sections in which all the various elements forming the section are not connected.

(ii) Shear lag can be reduced by reducing the length of outstanding leg of the angle section tension member.

(iii) Shear lag can be increased by increasing the area of the connected leg of the angle section.

(iv) At the connection of the angle section tension member, connected by one leg only, the entire cross section is subjected to uniform load.

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A) (i)

B) (ii)

C) (iii)

D) (iv) - **(Correct Answer)**

18. In the design bending strength of a laterally supported beam, M_d is given by $\beta_b \frac{Z_p F_y}{\gamma_{mo}}$ and β_b for plastic, compact and semi compact sections respectively are :

A) 1, 0.8, Z_e/Z_p

B) 1, 1, 0.8

C) 1,1, Z_e/Z_p – **(Correct Answer)**

D) 1,0.8, Z_p/Z_e

19. In case of low shear force, the design bending strength determined by $\frac{\beta_b Z_{pfy}}{\gamma_{mo}}$ is limited below $\frac{1.2 Z_{efy}}{\gamma_{mo}}$ for simple beams to ensure :

i) that onset of plasticity under unfactored loads is prevented

ii) that yield does not occur at working loads

iii) lateral torsional buckling is avoided

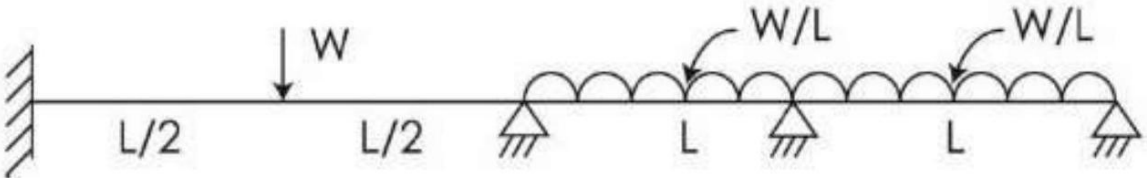
A) (i) and (ii) are correct - **(Correct Answer)**

B) Only (i) is correct

C) Only (iii) is correct

D) (i) and (iii) are correct

20. In the continuous beam shown in the following diagram, the plastic moment of resistance ' Mp′ is constant for the entire beam the collapse load of the structure is given by :



A) $\frac{8M_p}{L}$ - **(Correct Answer)**

B) $\frac{11.656M_p}{L}$

C) $\frac{12M_p}{L}$

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D) $\frac{16M_p}{L}$

21. Sieve Analysis conducted on a soil sample reveal the following datA) passing 4.75 mm sieve = 70%; passing 75 micron sieve = 4%; uniformity co-efficient=7; coefficient of curvature=3. The IS soil classification group symbol for the soil is :

A) SW - **(Correct Answer)**

B) SP

C) GW

D) GP

22. A sampler with a volume of 45 cm^3 is filled with soil sample. When the soil in the sampler is poured into a graduated cylinder containing water, it displaces 30 cm^3 of water. The porosity of soil is :

A) 33% - **(Correct Answer)**

B) 44%

C) 55%

D) 66%

23. A cylinder of soil fails under an axial vertical stress of 160kN/m^2 when it is laterally unconfined. The failure plane is inclined at 50° with the horizontal. The value of tan $50^o = 1.192$. The angle of internal friction and cohesion of soil are :

A) 10^o and 67.1 kPa - **(Correct Answer)**

B) 10^0 and 57.1 kPa

C) 10 and 47.1 kPa

D) 10 and 37.1 kPa

24. The theoretical maximum dry density for a soil sample having specific gravity of 2.7 and optimum moisture content of 16% is :

A) 1.675 g/cm^3

B) 1.545 g/cm^3

C) 1.885 g/cm^3 - **(Correct Answer)**

D) 1.995 g/cm^3

25. A good quality of undisturbed soil sample can be obtained using a sampling tube having an area ratio of :

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A) 16 %

B) 7 % - **(Correct Answer)**

C) 21 %

D) 28 %

26. The critical height of an unsupported vertical cut in a purely cohesive soil is : where C - Cohesion γ - Unit weight of soil

A) $\frac{4C}{\gamma}$ – (**Correct Alternative**)

B) $\frac{2C}{\gamma}$

C) $\frac{4\gamma}{C}$

D) $\frac{8C}{\gamma}$

27. The two basic criteria used for determining the allowable bearing pressure of a footing are :

A) Compression failure and settlement

B) Shear failure and settlement - **(Correct Answer)**

C) Compression and tensile failures

D) Tensile failure and settlement

28. As per Terzaghi's equation, the ultimate bearing capacity of strip footing resting on clay with cohesion $10kN/m^2$, for unit depth and unit width, is :

A) $5.7kN/m^2$

B) $11.4kN/m^2$

C) $57kN/m^2$ - **(Correct Answer)**

D) $114kN/m^2$

29. Rainfall intensity of 20 mm/hr occurred over a watershed of area 100 ha for a duration of 6 hr . Measured Direct Runoff volume in the stream draining the watershed was found to be $0,000\ m^3$. The precipitation not available to run off in this case is :

A) 9 cm - **(Correct Answer)**

B) 3 cm

C) 17.5 mm

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D) 5 mm

30. In the Muskingum method of channel routing, if the coefficients $k = 12hr, x = 0.15$ and the time step for routing $\Delta t = 4hr$, then the coefficient Co is :

A) 0.656

B) 0.328

C) 0.048

D) 0.016 - **(Correct Answer)**

31. A rectangular plate 3 m long and 1 m wide is immersed vertically in water in such a way that its 3 m side is parallel to the water surface and is 1 m below it. The total pressure on the plate is :

A) 44 · 14 kN - **(Correct Answer)**

B) 34.14 kN

C) 24.14 kN

D) 14.14 kN

32. If the x - component of velocity $u = 6xy - 2x^2$ in a possible case of flow, the y - component of the flow v is :

A) $6y^2 - 4xy$

B) $-6xy + 2x^2$

C) $6x^2 - 2xy$

D) $4xy - 3y^2$ – **(Correct Answer)**

33. BOD contribution per capita per day may be generally taken as :

A) 0.09 kg/day

B) 0.08 kg/day - **(Correct Answer)**

C) 0.05 kg/day

D) 0.03 kg/day

34. Arrange the following physical unit operations/unit process in sequence :

A) Screening, mixing, flow equalization, floculation, Air drying, sedimentation

B) Screening, flow equalization, mixing, floculation, sedimentation, Air drying - **(Correct Answer)**

C) Flow equalization, mixing, screening, sedimentation floculation, Air drying

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D) Air drying, screening, mixing, flow equalization, sedimentation, floculation

Calculate the total alkalinity of water containing 90mg/l of CO_3^{2} ions and 61mg/l of

35. HCO_3^{-} ions :

A) 133 ppm

B) 155 ppm

C) 200 ppm - **(Correct Answer)**

D) 100 ppm

36. Calculate the daily production of sludge at 95% removal of solids using the following datA) * Quantity of water treated $= 3 \times 10^4\ m^3/$ day $*$ Dosage of alum $=$ 45ppm * Total suspended solids = 400 ppm

A) 11400 kg/day - **(Correct Answer)**

B) 5700 kg/day

C) 2850 kg/day

D) 22800 kg/day

37. Determine the capacity of a single lane (unidirectional) on a Rural Highway in India. For a design speed of 50 kmph the average length of car can be taken as 5m. The perception-brake reaction time can be taken to be 2.5 sec. The co-efficient of friction can be assumed to be 0.5.

A) 845 vehicles per hour per lane

B) 847 vehicles per hour per lane

C) 833 vehicles per hour per lane

D) 840 vehicles per hour per lane - **(Correct Answer)**

38. A level is set up at a point 150 m from A and 100 m from B, the observed staff readings at A and B are 2.525 and 1.755 respectively. Find the true differences of level between A and B.

A) 0.7762

B) 0.7792

C) 0.7692 - **(Correct Answer)**

D) 0.7612

39. A bubble tube of a level has a sensitiveness of 20″ per 2 mm division. Find the error in the reading on the staff held at a distance of 100 m from the level

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when the bubble is deflected by two divisions from the centre.

A) 0.19 cm

B) 0.019 cm

C) 0.19 m

D) 0.019 m - **(Correct Answer)**

40. The distance between two stations was 1200 m when measured with a 20 m chain. The same distance when measured with 30 m chain was found to be 1195 m . If the 20 m chain was 0.05 m too long, what was the error in the 30 m chain ?

A) -0.3 m

B) + 0.3 m

C) -0.20 m

D) +0.20 m - **(Correct Answer)**

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