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COMBINED COMPETITIVE (PRELIMINARY) EXAMINATION, 2012

Serial No. ____

CIVIL ENGINEERING
Code No. 05

A

Time Allowed : Two Hours | ***Maximum Marks : 300***

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ROUGH WORK

1. Internal forces in every cross section in an arch are :
   (A) Normal thrust and shear force
   (B) Shear force and bending moment
   (C) Normal thrust and bending moment
   (D) Normal thrust, shear force and bending moment

2. If an element is subjected to pure shearing stress then maximum principal stress is equal to :
   (A) $2\tau_{xy}$ (B) $\tau_{xy} / 2$
   (C) τ_{xy} (D) $\left(1-\tau_{xy}^2\right)^{1/2}$

3. If a prismatic member with area of cross section 'A' is subjected to a tensile load 'P', then the maximum shear stress and its inclination with the direction of load respectively are :
   (A) P/A and 45° (B) $P/2A$ and 45°
   (C) $P/2A$ and 60° (D) P/A and 30°

4. The stiffness of a helical spring is expressed as :
   (A) Load per unit length (B) Load per unit deflection
   (C) Load per unit diameter (D) Deflection per unit load

5. For a circular column having its ends hinged, the slenderness ratio is 160, the l/d ratio of the column is :
   (A) 80 (B) 57
   (C) 40 (D) 20

6. A prismatic bar of volume V is subjected to a compressive force in the longitudinal direction. If the Poisson's ratio of the bar is m and the longitudinal strain is ε, then the final volume of the bar will be :
   (A) $(1+\varepsilon)(1-m\varepsilon)^2 V$ (B) $\left(1-\varepsilon^2\right)(1+m\varepsilon)V$
   (C) $(1+\varepsilon)(1+m\varepsilon)^2 V$ (D) $(1-\varepsilon)(1+m\varepsilon)^2 V$

7. The resultant cuts the base of the circular column of diameter d with an eccentricity equal to d/4. The ratio between the maximum compressive stress and the maximum tensile stress is :
   (A) 3 (B) 4
   (C) 5 (D) Infinity

8. The shafts are designed on the basis of :
   (A) strength (B) rigidity
   (C) either of the above (D) both

9. The maximum deflection of a fixed beam carrying central load W is equal to :
   (A) $WL^3/48EI$ (B) $WL^3/96EI$
   (C) $WL^3/192EI$ (D) $5WL^3/384EI$

10. The shear stress distribution over a rectangular cross section of a beam follows :
   (A) A straight line path (B) A circular path
   (C) A parabolic path (D) An elliptical path

11. A three hinged parabolic arch rib with hinges at abutments and at crown is under the action of udl w per unit length over its entire span L through its crown, the bending moment at quarter span is :
   (A) 0 (B) $wL^2/8$
   (C) $wL^2/12$ (D) $wL^2/24$

12. The ratio of intensity of stress in case of a suddenly applied load to that in case of a gradually applied load is :
   (A) 0.5 (B) 1
   (C) 2 (D) More than 2

13. Thin cylinders are frequently required to operate under pressure up to :
   (A) $5\ MN/m^2$ (B) $15\ MN/m^2$
   (C) $30\ MN/m^2$ (D) $250\ MN/m^2$

14. A fixed beam of uniform section is carrying a point load at its mid span. If the moment of inertia of the middle half length is now reduced to half its previous value then the fixed end moment will :
   (A) increase (B) decrease
   (C) remain constant (D) change their directions

15. Due to some point load anywhere on a fix beam the maximum free bending moment is M, the sum of fixed end moment is :
   (A) M (B) 1.5 M
   (C) 2.0 M (D) 3.0 M

16. Which of the following pairs is not correctly matched ?
(A) Lame's constant : thick cylinder (B) Macaulay's method : deflection of beams
(C) Euler's method : theory of columns (D) Eddy's theorem : torsion of shafts

17. If the diameter of the shaft subjected to torque alone is doubled, then the horse power P can be increased to :
(A) 16 P (B) 8 P
(C) 4 P (D) 2 P

18. In an experiment it is found that the bulk modulus of a material is equal to its shear modulus, the Poisson's ratio of the material is :
(A) 0.125 (B) 0.250
(C) 0.375 (D) 0.500

19. For vertical columns of the same material, height and weight have the same end conditions. The buckling load will be the largest for a column having a cross section of a/an :
(A) Solid square (B) Thin hollow circle
(C) Solid circle (D) I-section

20. A linear arch has :
(A) Normal thrust only (B) Shear force only
(C) Bending moment only (D) Normal thrust and shear force

21. A hollow shaft will transmit ---------- power than a solid shaft of same weight and material.
(A) Less (B) Same
(C) More (D) None of the above

22. The horizontal thrust due to rise in temperature in a semi circular two hinged arch of radius R is proportional to :
(A) R (B) R^2
(C) 1/R (D) $1/R^2$

23. A cantilever beam AB fixed at A and carrying a load W at free end B is found to deflect by δ at the midpoint of AB. The deflection of B due to load W/2 at the midpoint will be :
(A) 2δ (B) δ
(C) $\delta/2$ (D) $\delta/4$

24. When a load crosses a through type Pratt truss in the direction left to right, the nature of force in any diagonal member in the left half of the span would :
(A) Change from compression to tension (B) Change from tension to compression
(C) Always be compression (D) Always be tension

25. The moment at the intermediate support of a two span continuous beam of 6 m each with simple supports at the ends carrying a udl of 20 kN/m over only the left span is (flexural rigidity is same for both spans) :
(A) 90 kNm hogging (B) 45 kNm hogging
(C) 45 kNm sagging (D) zero

26. The following methods are used for structural analysis :
(1) Macaulay's method
(2) Column analogy method
(3) Kani's method
(4) Method of section
Those used for indeterminate structure analysis would include :
(A) 1 & 2 (B) 1 & 3
(C) 2 & 3 (D) 2, 3 & 4

27. In a Two hinged arch an increase in temperature induces :
(A) No bending moment in the arch rib
(B) Uniform bending moment in the arch rib
(C) Maximum bending moment at the crown
(D) Minimum bending at the crown

28. The graphical method of determining the forces in the members of a truss is based on :
(A) Method of joints (B) Method of sections
(C) Either method (D) None of the two methods

29. If y is force, and x is velocity then dimensions of $\frac{\partial^2 y}{\partial x^2}$ are :
(A) $M^1 L^o T^1$ (B) $M^1 L^{-1} T^0$
(C) $M^1 L^{-1} T^1$ (D) $M^1 L^o T^{-3}$

30. When a body slides down an inclined surface the acceleration of the body is given by :
(A) g (B) $g \sin\theta$
(C) $g \cos\theta$ (D) $g \tan\theta$

31. Different grades are joint together by :
(A) compound curve (B) vertical curve
(C) reverse curve (D) transition curve

32. The tilt displacement in an aerial photograph is radial from :
(A) plumb point (B) isocentre point
(C) principal point (D) nadir point

33. In a parabolic vertical curve, the rising grade $g_1 = +0.8\%$, the falling grade $g_2 = -0.7\%$. The rate of change of grade is 0.05 per chain. The length of vertical curve is :
(A) 30 chains (B) 40 chains
(C) 50 chains (D) 60 chains

34. If 'fore-bearing' of a line is S 49°52′ E (assuming there is no local attraction), the 'back-bearing' of the line will be :
(A) S 52° 49′ E (B) S 49° 52′ E
(C) N 49°08′ E (D) N 49° 52′ E

35. A lemniscate curve between tangents is transitional throughout, the polar deflection angle of its apex is equal to (φ is the deflection angle between initial and final angles):
(A) $\varphi/2$ (B) $\varphi/4$
(C) $\varphi/6$ (D) φ

36. An observer standing on the deck of a ship just sees the top a lighthouse which is 30 mt.s above sea-level, if the height of the observer's eye is 10 mt.s above sea-level, then the distance of the observer from the lighthouse will be nearly :
(A) 22.5 km (B) 24.3 km
(C) 33.3 km (D) 59.7 km

37. Which one of the following methods estimates best the area of an irregular and curved boundary ?
(A) Trapezoidal method (B) Simpson's method
(C) Average Ordinate method (D) Mid-Ordinate method

38. In setting out a long straight line for the erection of the transmission towers, it is recommended that the forward point be set out with both face right and face left, with reference to the preceding point and mean position be taken. This field procedure eliminates the instrumental error where the :
(A) Trunnion axis is not perpendicular to the vertical axis
(B) Vertical axis is not perfectly vertical at the time of observation
(C) Line of collimation is not perpendicular to vertical axis
(D) Line of collimation is not perpendicular to horizontal axis

39. If the downhill end of a 20 m tape is held 80 cm too low, then its horizontal length will be :
(A) 19.894 m (B) 19.984 m
(C) 20.016 m (D) 20.984 m

40. If in a triangle ABC, b = 300 m, $\angle ABC = 60^{\circ}$, then the radius of circular curve passing through the points A, B and C will be :
(A) 86.6 m (B) 100 m
(C) 173.2 m (D) 300.6 m

41. The back-sight reading on a vertically held staff at a point A on the floor along the central line of a railway tunnel is 3.465 m, and the fore-sight of inverted staff held at the roof of the tunnel, just vertically above A is 1.155 m. The height of the tunnel along the central line at floor point A is :
(A) 2.310 m (B) 3.465 m
(C) 4.620 m (D) 6.930 m

42. A plan of an area drawn with the original scale of 1 cm = 10 m, has shrunk such that a line, originally 15 cm long on the plan, measures now 14.5 cm. The shrunk scale is given by 1 cm is equal to :
(A) 0.97 m (B) 9.70 m
(C) 10.34 m (D) 10.97 m

43. The length of transition curve for a circular curve of radius 300 m and for a design speed of 15 m/s, when the rate of change of centrifugal acceleration is 0.3 m/s^3 is :
(A) 30 m (B) 37.5 m
(C) 45 m (D) 60 m

44. When the bubble of a level tube was moved by 10 divisions, the change in staff intercept was 0.05 m. If the distance between the staff and the instrument was 100 m, then the sensitiveness of bubble tube is given by :

(A) 1.03 sec of arc
(B) 10.3 sec of arc
(C) 20.6 sec of arc
(D) 103 sec of arc

45. If the azimuths of two tangents to a circular curve of radius 100 m are due north and due east, then the area bounded by two tangents and circular curves will be :

(A) 7857 sq m
(B) 5000 sq m
(C) 3143 sq m
(D) 2143 sq m

46. Which of the following statements about photogrammetric surveying is correct ? The relief displacement :

(A) Decreases with increase in flying height
(B) Is negative for a point above datum
(C) Decreases as distance of the object from principal point increases
(D) Of the point is not affected by the tilt of the photograph

47. Which one of the following instruments is used in plane table surveying for the measurement of horizontal and vertical distances directly ?

(A) Plain alidade
(B) Telescopic alidade
(C) Tachometer
(D) Clinometers

48. Deflection angle between the tangents drawn at the ends of a transition curve is 7^{o}. The radius of the curve at the end is 400 m. What is the length of the transition curve ?

(A) 60 m
(B) 97.74 m
(C) 120 m
(D) 150 m

49. If parallax difference between the top and bottom of tree is measured as 1.32 mm on a stereo pair of photos taken at 3000 m above ground and the average photo base is 66 m, then the height of the tree will be :

(A) 45.49 m
(B) 60.00 m
(C) 23.51 m
(D) 39.50 m

50. A star culminates in zenith when :

(A) $\delta < \theta$
(B) $\delta > \theta$
(C) $\delta \leq \theta$
(D) $\delta = \theta$

where δ = declination and θ = latitude

51. A 30 m long steel tape is standardized with a pull of 100 N, was used for measuring a baseline of length 1500 m, the pull exerted while measuring is 150 N. The correction C_p due to pull is given by (the area of cross-section of tape = A, Young's modulus = E) :

(A) $100 \times 1500/AE$ (B) $1500 \times 150/AE$

(C) $50 \times 1500/AE$ (D) $250 \times 1500/AE$

52. Excavation is to be made for a reservoir measuring 20 m long, 12 m wide at the bottom and 2 m deep. The side-slopes are to be 1:1 and the top to be flush with the ground which is level in the vicinity as per prismoidal formula, the volume of excavation will be :

(A) $610.33\ m^3$ (B) $618.66\ m^3$

(C) $625.00\ m^3$ (D) $633.66\ m^3$

53. Which one of the following specifications for length of base line refers to Third Order Triangulation System ?

(A) 5 to 3 km (B) 1.5 to 5 km

(C) 5 to 15 km (D) 10 to 20 km

54. If R is the radius of the main curve, θ is the angle of deflection, S is the shift and L is the length of the transition curve, then the total tangent length of the curve is given by :

(A) $(R - S) \tan \theta/2 - L/2$ (B) $(R + S) \tan \theta/2 - L/2$

(C) $(R + S) \tan \theta/2 + L/2$ (D) $(R - S) \tan \theta/2 + L/2$

55. The representative fraction 1/2500 means that the scale is 1 cm =

(A) .25 m (B) 2.5 m

(C) 25 m (D) 2.5 km

56. The ratio of the "standard error if a single observation of a unit weight" to the standard error of the arithmetic mean of 'n' observations, all of unit weight, will be :

(A) 1/n (B) n^2

(C) $\sqrt[3]{n}$ (D) $\sqrt{n}$

57. The number of independent conditions required to be satisfied for the adjustment of a braced quadrilateral in triangulation survey is :

(A) 2 (B) 4

(C) 6 (D) 8

58. In a close traverse, the sum of south latitudes exceeds the sum of north latitudes and the sum of east departures exceeds the sum of west departures. The closing line will lie in the :
(A) N–W quadrant (B) N–E quadrant
(C) S–E quadrant (D) S–W quadrant

59. A 30 m metric chain is found to be 0.1 m too short throughout the measurement. If the distance measured is recorded as 300 m, then the actual distance will be :
(A) 300.1 m (B) 301.0 m
(C) 299 m (D) 310.0 m

60. Offsets are :
(A) Lateral measurements made with respect to main survey lines
(B) Perpendiculars erected from chain lines
(C) Taken to avoid walking between stations
(D) Measurements which are not made at right angles to the chain lines.

61. Sheep foot rollers are recommended for compacting :
(A) granular soil (B) cohesive soil
(C) hard rock (D) any type of soil

62. Negative skin friction in a soil is considered when the pile is constructed through a :
(A) fill material (B) dense coarse sand
(C) over consolidated stiff clay (D) dense fine sand

63. The flow-net is drawn to obtain :
(A) Seepage, coefficient of permeability and uplift pressure
(B) Coefficient of permeability, exit gradient and uplift pressure
(C) Exit gradient, seepage quantity and uplift pressure
(D) Exit gradient, seepage, coefficient of permeability

64. The critical hydraulic gradient i_c of a soil mass of specific gravity g and void ratio e is given by :
(A) $i_c = \frac{G+1}{1-e}$ (B) $i_c = \frac{G-1}{1+e}$
(C) $i_c = \frac{G+1}{1+e}$ (D) $i_c = \frac{G-1}{1-e}$

65. The correct increasing order of the surface areas of the given soil is :
(A) silt, sand, collides, clay
(B) Sand, silt, collides, clay
(C) Sand, silt, clay, collides
(D) Clay, silt, sand, collides

66. Given that for a single degree of freedom system :
k = stiffness coeff.
m = mass of machine and foundation
Critical damping is best defined by the expression :
(A) $2\sqrt{km}$
(B) $2k\sqrt{m}$
(C) $2\pi k\sqrt{1/m}$
(D) $(1/2\pi)\sqrt{k/m}$

67. Terzaghi's equation of ultimate bearing capacity for a stripped footing may be used for square footing resting on pure clay soil with the correction factor :
(A) 0.4
(B) 0.6
(C) 1.2
(D) 1.3

68. Undisturbed soil samples are required for conducting :
(A) Hydrometer test
(B) Shrinkage limit test
(C) Consolidation test
(D) Specific gravity test

69. When the degree of consolidation is 50% the time factor is about :
(A) 0.2
(B) 0.5
(C) 0.6
(D) 2.0

70. A soil having particles of nearly the same size is known as :
(A) well graded
(B) uniformly graded
(C) poorly graded
(D) gap graded

71. The unit weight of a soil at zero air voids depends on :
(A) specific gravity
(B) water content
(C) unit weight of water
(D) all of the above

72. The soil most susceptible to liquefaction are :
(A) saturated dense sand
(B) saturated fine and medium sands of uniform particle size
(C) saturated clays of uniform size
(D) saturated gravels and cobbles

73. Degree of freedom of a block type machine foundation is :
(A) 2 (B) 3
(C) 4 (D) 6

74. Terzaghi's bearing capacity factor N_c, N_q and N_γ are functions of :
(A) cohesion only
(B) angle of internal friction only
(C) both cohesion and angle of internal friction
(D) none of the above

75. In consolidation testing, curve fitting method is used to determine :
(A) Compression index (B) Swelling index
(C) Coeff. of consolidation (D) Time factor

76. By using sieve analysis, the particles size distribution curve has been plotted for a particular soil, the coeff. of curvature C_c is given by :
(A) $\frac{D_{30}}{D_{30}D_{10}}$ (B) $\frac{\sqrt{D_{30}}}{D_{60}D_{10}}$
(C) $\frac{D_{30}}{\sqrt{D_{60}D_{10}}}$ (D) $\frac{D^2{}_{30}}{D_{60}D_{10}}$

77. Lacustrine soils are soils :
(A) Transported by rivers and streams (B) Transported by glaciers
(C) Deposited in sea beds (D) Deposited in lake beds

78. The configuration of flow net depends upon :
(A) The permeability of the soil
(B) The difference in the head between upstream and downstream sides
(C) The boundary conditions of flow
(D) The amount of seepage that takes place

79. In a Mohr's diagram a point above Mohr's envelope indicates :
(A) Imaginary condition (B) Safe condition
(C) Imminent failure condition (D) Condition of maximum obliquity

80. A good quality undisturbed soil sample is one which is obtained using a sampling tube having an area ratio of :

(A) 8% (B) 16%

(C) 24% (D) 32%

81. A sample of soil has the following properties :

Liquid limit = 45%

Plastic limit = 25%

Shrinkage limit = 17%

Natural moisture content = 30%

The consistency index of the soil is :

(A) 15/20 (B) 13/20

(C) 8/20 (D) 5/20

82. According to Rankine's analysis minimum depth of foundation is equal to :

(A) $\frac{q}{\gamma}\left(\frac{1+\sin\phi}{1-\sin\phi}\right)^2$ (B) $\frac{q}{\gamma}\left(\frac{1-\sin\phi}{1+\sin\phi}\right)^2$

(C) $\frac{q}{\gamma}\left(\frac{1+\sin\phi}{1-\sin\phi}\right)$ (D) $\frac{q}{\gamma}\left(\frac{1-\sin\phi}{1+\sin\phi}\right)$

83. Passive earth pressure in a soil mass is proportional to :

(A) $\tan^2(45 + \phi/2)$ (B) $\mu/(1 - \mu)$

(C) $\tan^2(45 - \phi/2)$ (D) $\cot^2(45 + \phi/2)$

where μ is Poisson's ratio and ϕ is the effective angle of internal friction.

84. For a base failure, the depth factor D_f is :

(A) 0 (B) 1

(C) $0 < D_f < 1$ (D) $D_f > 1$

85. Rise of water table in cohesion-less soil up to ground surface reduces the net ultimate bearing capacity approximately by :

(A) 25% (B) 50%

(C) 75% (D) 90%

86. In a saturated clay layer undergoing consolidation with single drainage at its top the pore water pressure would be the maximum at its :
(A) top (B) middle
(C) bottom (D) top as well as the bottom

87. A cantilever sheet pile drives its stability from :
(A) lateral resistance of soil (B) self weight
(C) dead weight (D) the anchor rod

88. The time 't' required for attaining a certain degree of consolidation of a clay layer is proportional to :
(A) H^2 and C_v (B) H^2 and $1/C_v$
(C) $1/H^2$ and C_v (D) $1/H^2$ and $1/C_v$

89. The upstream slope of an earth dam under steady seepage condition is :
(A) equi-potential line (B) phreatic line
(C) flow–net (D) seepage flow

90. In the soil sample of a consolidometer test, pore water pressure is :
(A) minimum at the centre (B) maximum at the top
(C) maximum at the bottom (D) maximum at the centre

91. Centre of buoyancy always :
(A) Coincides with the centre of gravity
(B) Coincides with the centroid of the volume of fluid displaced
(C) Remains above the centre of gravity
(D) Remains below the centre of gravity

92. The increase in metacentric height :
1. Increases stability
2. Decreases stability
3. Increases comfort for passengers
4. Decreases comfort for passengers

The correct answer is :
(A) 1 and 3 (B) 1 and 4
(C) 2 and 3 (D) 2 and 4

93. When the velocity distribution is uniform over the cross-section, the correction factor for momentum is :

(A) 0 (B) 1

(C) 4/3 (D) 2

94. Streamlines and path lines always coincides in case of :

(A) Steady flow (B) Laminar flow

(C) Uniform flow (D) Turbulent flow

95. The pitot-tube is used to measure :

(A) Velocity at stagnation point (B) Stagnation pressure

(C) Static pressure (D) Dynamic pressure

96. The discharge through a V-notch varies as :

(A) $H^{1/2}$ (B) $H^{3/2}$

(C) $H^{5/2}$ (D) $H^{5/4}$

where H is head.

97. The pressure at the summit of the siphon is :

(A) equal to atmospheric (B) less than atmospheric

(C) more than atmospheric (D) none of the above

98. If X is the distance from leading edge, then the boundary layer thickness in laminar flow varies as :

(A) $X^{1/2}$ (B) $X^{4/5}$

(C) $X^{3/5}$ (D) $X^{1/7}$

99. For shooting flow the Froude number is :

(A) 0 (B) Less than 1

(C) 1 (D) Greater than 1

100. If 'f' is the friction factor, then Chezy's coefficient is proportional to :

(A) f (B) $\sqrt{f}$

(C) 1/f (D) $1/\sqrt{f}$

101. The critical state of flow in a non-rectangular channel is expressed by :

(A) $y_c = (\frac{q^2}{g})^{1/3}$ (B) $\frac{Q^2}{g} = \frac{A^3}{T}$

(C) $\frac{Q^3}{g} = \frac{A^2}{T}$ (D) $\frac{Q^2}{g} = \frac{A}{T^3}$

102. Flow through a venturi-flume is maximum when the depth at the throat is :

(A) Half (B) 1/3

(C) 2/3 (D) Equal to the total energy of the flow

103. Super critical flow can occur in a :

(A) Channel with a mild slope (B) Channel with a steep slope

(C) Horizontal channel (D) All of the above

104. Which one of the following velocity fields represents a possible fluids flow ?

(A) U = x; v = y (B) $U = x^2$; $v = y^2$

(C) U= xy; $v = x^2y^2$ (D) U = x; v = – y

105. A model of reservoir is emptied in 10 min. If the model scale is 1 : 25, the time taken by the prototype to empty itself would be :

(A) 250 min (B) 50 min

(C) 6250 min (D) 2 min

106. A model of weir made to a horizontal scale of 1/40, vertical scale of 1/9, discharges 1 liter per second. Then the discharge in the prototype is estimated as :

(A) 1 lps (B) 108 lps

(C) 1080 lps (D) 10800 lps

107. In a 2-D incompressible flow if the fluid velocity components are given by u = x –4y, v = – y – 4x, then the stream function ψ is given by :

(A) $x^2 – xy + 2y^2$ (B) $2x^2 + 2xy + y^2$

(C) $2x^2 + xy – y^2$ (D) $2x^2 – xy + 2y^2$

108. Absolute pressure in a flow system :
(A) Always above local atm. pressure
(B) Is the vacuum pressure
(C) May be above, below or equal to the local atm. Pressure
(D) Also called negative pressure

109. Normal acceleration in a fluid flow situations exist only when :
(A) The flow is 2-D
(B) The flow is unsteady
(C) The streamlines are curved
(D) None of the above

110. The velocity potential function for a source varies with distance r as :
(A) $1/r$
(B) $1/r^2$
(C) e^r
(D) $1n\ r$

111. The change in moment of momentum of fluid due to flow along a curved path results in :
(A) a dynamic force which passes through the centre of curvature
(B) a torque
(C) a change in pressure
(D) a change in the total energy

112. The flow in the model & prototype will be dynamically similar when :
(A) the forces in the two systems are the same
(B) the two are geometrically similar
(C) the two are kinematically similar
(D) the forces at similar points in the two systems have the same ratio throughout the flow field

113. The turbulent flow is considered steady when :
(A) the discharge remains constant
(B) temporal mean velocity at a point remains constant with time
(C) the velocity at point doesn't change with time
(D) the algebraic sum of velocity fluctuations is zero

114. For the laminar boundary layer, its thickness is expressed as the following relationship :
(A) $\delta = 5x/\sqrt{R_x}$
(B) $\delta = .664x/\sqrt{R_x}$
(C) $\delta = .664x/R_x^{0.20}$
(D) $\delta = 1.75x/\sqrt{R_x}$
where $R_x = U_\infty x/\nu$ is the plate Reynolds no.

115. Uniform flow in open channel is characterized by :

(A) a changing depth of flow
(B) a constant discharge passing down the channel
(C) a constant depth of flow
(D) a constant slope of channel bottom

116. The rapid closure of wall in a water pipeline will result in water hammer pressure of magnitude :

(A) $\rho C^2 V$
(B) $\rho C V^2$
(C) $\rho C / V$
(D) $\rho C V$

117. The pressure wave in a fluid medium travels as a sound wave, the velocity of which is given by :

(A) $C = \sqrt{\frac{E}{\rho}}$
(B) $C = \sqrt{\rho k}$
(C) $C = \sqrt{\rho / E}$
(D) $C = \frac{E}{\rho}$

118. The pressure drop per unit length of pipe ($\Delta p/L$) in laminar flow is dependent on the velocity, viscosity and the diameter. It is equal to :

(A) $\frac{d^2}{32\mu V}$
(B) $\frac{32\mu V}{d^2}$
(C) $\frac{32\mu VL}{\gamma d^2}$
(D) $\frac{8\mu V}{d^2}$

119. The existence of boundary layer is on account of :

(A) fluid viscosity
(B) fluid density
(C) flow turbulence
(D) surface tension

120. Coefficient of velocity for Borda's mouthpiece running full is :

(A) 0.611
(B) 0.707
(C) 0.855
(D) 1.00

ROUGH WORK