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**T. B. C. : AEC – 2/2015**

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**Test Booklet Series**

**A**

# TEST BOOKLET

## ASSISTANT EXECUTIVE ENGINEER

## CIVIL ENGINEERING (PAPER – II)

*Time Allowed : 3 Hours*

*Maximum Marks : 180*

**: INSTRUCTIONS TO CANDIDATES :**

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET **DOES NOT** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET OF THE SAME SERIES ISSUED TO YOU.
2. ENCODE CLEARLY THE TEST BOOKLET SERIES **A, B, C** OR **D**, AS THE CASE MAY BE, IN THE APPROPRIATE PLACE IN THE ANSWER SHEET USING BALL POINT PEN (BLUE OR BLACK).
3. You have to enter your **Roll No.** on the Test Booklet in the Box provided alongside. **DO NOT** write *anything else* on the Test Booklet.
4. This Test Booklet contains **90** items (questions). Each item (question) comprises four responses (answers). You have to select the correct response (answer) which you want to mark (darken) on the Answer Sheet. In case, you feel that there is more than one correct response (answer), you should mark (darken) the response (answer) which you consider the best. In any case, choose **ONLY ONE** response (answer) for each item (question).
5. You have to mark (darken) all your responses (answers) **ONLY** on the **separate Answer Sheet** provided, by **using BALL POINT PEN (BLUE OR BLACK)**. See instructions in the Answer Sheet.
6. All items (questions) carry equal marks. All items (questions) are compulsory. Your total marks will depend only on the number of correct responses (answers) marked by you in the Answer Sheet. **There will be no negative marking for wrong answer.**
7. Before you proceed to mark (darken) in the Answer Sheet the responses to various items (questions) in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per the instructions in your **Admission Certificate**.
8. After you have completed filling in all your responses (answers) on the Answer Sheet and after conclusion of the examination, you should hand over to the Invigilator the *Answer Sheet* issued to you. You are allowed to take with you the candidate's copy/second page of the Answer Sheet along with the *Test Booklet* after completion of the examination for your reference.

SEAL

**DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO**

1. The pressure of a liquid measured with the help of a piezometer tube is :

(A) Vacuum pressure

(B) Gauge pressure

(C) Absolute pressure

(D) Atmospheric pressure

2. When a fluid is flowing through a pipe, the velocity of the liquid is :

(A) Maximum at the center and minimum near the walls

(B) Minimum at the center and maximum near the walls

(C) Zero at the center and maximum near the walls

(D) Maximum at the center and zero near the walls

3. The hydraulic mean depth for a circular pipe of diameter d is :

(A) d/6

(B) d/4

(C) d/2

(D) d

4. In case of flow through parallel pipes :

(A) The head loss for all the pipes is same

(B) The head loss is different in different pipes

(C) The head loss is the sum of head losses in the various pipes

(D) None of the above

5. The critical depth for a channel is given by :

(A) $\left(\frac{q}{g}\right)^{1/2}$

(B) $\left(\frac{q^2}{g}\right)^{1/3}$

(C) $\left(\frac{q^3}{g}\right)^{1/4}$

(D) $\left(\frac{q^4}{g}\right)^{1/5}$

6. When the Mach number is less than unity, the flow is called :

(A) Sub-sonic flow

(B) Sonic flow

(C) Super-sonic flow

(D) Hyper-sonic flow

7. The power developed by a turbine is :

(A) Directly proportional to $H^{1/2}$

(B) Inversely proportional to $H^{1/2}$

(C) Directly proportional to $H^{3/2}$

(D) Inversely proportional to $H^{3/2}$

8. Which of the following pumps is suitable for small discharge and high head ?

(A) Centrifugal pump

(B) Axial flow pump

(C) Mixed flow pump

(D) Reciprocating pump

9. The ratio between the area of crop irrigated and quantity of water required during its entire period of the growth, is known as :

(A) Delta

(B) Duty

(C) Base period

(D) Crop period

10. The graphical representation of average rainfall and rainfall excess (i.e., rainfall minus infiltration) rates over specified areas during successive unit time intervals during a storm is known as :

(A) Hydrograph

(B) Unit hydrograph

(C) Hyetograph

(D) None of the above

11. According to Lacey's equation, the scour depth is equal to :

(A) $0.47\left(\frac{Q}{f}\right)^{1/2}$

(B) $0.47\left(\frac{Q}{f}\right)^{1/3}$

(C) $0.47\left(\frac{Q}{f}\right)^{1/4}$

(D) $0.47\left(\frac{Q}{f}\right)^{1/5}$

12. The phenomenon occurring in an open channel when a rapidly flowing stream abruptly changes to a slowly flowing stream causing a distinct rise of liquid surface, is :

(A) Water hammer

(B) Hydraulic jump

(C) Critical discharge

(D) None of the above

13. Dimensions of the dynamic viscosity ($\mu$) are :

(A) $MLT^{-2}$

(B) $M^{-1}L^{-1}T^{-1}$

(C) $ML^{-1}T^{-1}$

(D) None of the above

14. When a canal is carried over a natural drainage, the structure provided, is known as :

(A) Syphon

(B) Aqueduct

(C) Super passage

(D) Syphon-aqueduct

15. The maximum vacuum created at the summit of a syphon is :

(A) 2.7 m of water

(B) 7.4 m of water

(C) 74 mm of water

(D) 74 m of water

16. An ideal flow of a liquid obeys :

(A) Continuity equation

(B) Newton's law of viscosity

(C) Newton's second law of motion

(D) Dynamic viscosity law

17. Reynold's number is the ratio of inertial force and :

(A) Viscosity

(B) Elasticity

(C) Gravitational force

(D) Surface tension

18. Differential manometers are used to measure :

(A) Pressure in water channels, pipes, etc.

(B) Difference in pressure at two points

(C) Atmospheric pressure

(D) Very low pressure

19. Highest dam in India, is

(A) Hirakud dam

(B) Nagarjuna Sagar dam

(C) Idukki dam

(D) Bhakra dam

20. If $C_v$, $C_c$, $C_d$ and $C_r$ are the hydraulic coefficients of an orifice, then :

(A) $C_d = C_c \cdot C_v$

(B) $C_r = 1 + C_v^2/C_d$

(C) $C_v = C_c + C_d$

(D) $C_c = C_v/C_d$

21. For the stability of a structure against seepage pressure according to Khosla's Creep Theory, the critical gradient is :

(A) 0.0

(B) 0.5

(C) 1.0

(D) 0.75

22. The main function of a diversion head works of a canal from a river is :

(A) To remove silt

(B) To control floods

(C) To raise water level

(D) To store water

23. The standard height of a standard rain gauge is :

(A) 10 cm

(B) 20 cm

(C) 30 cm

(D) 40 cm

24. For determination of average annual precipitation in a catchment basin, the best method is :

(A) Arithmetical Method

(B) Thiessen's mean Method

(C) Isohyetal Method

(D) None of the above

25. Isohytes are the imaginary lines joining the points of equal :

(A) Pressure

(B) Height

(C) Humidity

(D) Rainfall

26. For large cities, the suitable method for forecasting population is :

(A) Arithmetical increase method

(B) Graphical method

(C) Geometrical increase method

(D) Comparative method

27. The maximum permissible total solid content in water for domestic purposes should not exceed :

(A) 300 ppm

(B) 400 ppm

(C) 500 ppm

(D) 1000 ppm

28. The maximum permissible chlorine content for public supplies should be between :

(A) 0.1 to 0.2 ppm

(B) 0.3 to 0.4 ppm

(C) 1.2 to 4.0 ppm

(D) 6.5 to 8.0 ppm

29. The bacterias which require oxygen for their survival is known as :

(A) Anaerobic bacteria

(B) Pathogenic bacteria

(C) Non-pathogenic bacteria

(D) Aerobic bacteria

30. The self cleaning velocity, recommended for Indian conditions, in order to prevent settling down sewage at the bottom or on the sides of a large sewer is :

(A) 0.25 m/s

(B) 0.50 m/s

(C) 0.75 m/s

(D) 1.5 m/s

31. Sludge treatment is mainly done in order to :

(A) Stabilize the organic matter

(B) Destroy the pathogenic bacteria

(C) Reduce the water content

(D) All of the above

32. Aerobic bacterias :

(A) Flourish in the presence of free oxygen

(B) Consume organic matter as their food

(C) Oxidise organic matter in sewage

(D) All of the above

33. Most commonly used pump for lifting water in water supply mains, is :

(A) Reciprocating pump

(B) Axial flow pump

(C) Rotary type pump

(D) Centrifugal pumps

34. By boiling water, hardness can be removed if it is due to :

(A) Calcium sulphate

(B) Calcium bicarbonate

(C) Magnesium sulphate

(D) Calcium nitrate

35. Aeration of water is done to remove :

(A) Odour

(B) Colour

(C) Bacterias

(D) Turbidity

36. Increase in population of a rapidly growing city, may be estimated by :

(A) Arithmetical mean method

(B) Geometric grouth method

(C) Incremental increase method

(D) Graphical comparison method

37. During treatment of water, sedimentation is done :

(A) Before filtration

(B) After filtration

(C) Simultaneously with filtration

(D) Along with chlorination

38. An area is declared drought affected if its mean rainfall is less than :

(A) 50%

(B) 60%

(C) 75%

(D) 85%

39. The permissible pH value for public water supplies may range between :

(A) 4.5 – 5.5

(B) 5.5 – 6.5

(C) 6.5 – 8.5

(D) 7.0 – 8.5

40. Water losses in water supply is assumed as :

(A) 5%

(B) 7.5%

(C) 10%

(D) 15%

41. The soil transported by wind is called :

(A) Aeolian soil

(B) Marine soil

(C) Alluvial soil

(D) Lacustrine soil

42. A soil sample is having a specific gravity of 2.6 and a void ratio of 0.78. The water content in percentage required to fully saturate the soil at that void ratio is :

(A) 10%

(B) 30%

(C) 50%

(D) 70%

43. The ratio of the unconfined compressive strength of undisturbed soil to the unconfined compressive strength of soil in a remoulded state, is called :

(A) Sensitivity

(B) Thixotropy

(C) Relative strength

(D) None of the above

44. The ratio of settlement at any time, t to the final settlement is known as :

(A) Compression ratio

(B) Coefficient of consolidation

(C) Compression index

(D) Degree of consolidation

45. The suitable method of finding the shear strength of very plastic cohesive soils is by means of :

(A) Cone test

(B) Penetration test

(C) Vane shear test

(D) Torsional shear test

46. The coefficient of earth pressure at rest is given by :

(A) $\mu/(1-\mu)$

(B) $(1+\mu)/\mu$

(C) $\mu/(1+\mu)$

(D) $(1-\mu)/\mu$

47. A vertical cut in a clayey soil with unit weight of 19 $kN/m^3$ failed when the depth of cut was 4.0 m. The cohesive strength of clay is :

(A) 76.0 $kN/m^2$

(B) 8.5 $kN/m^2$

(C) 38 $kN/m^2$

(D) 19.0 $kN/m^2$

48. According to IS classification, the range of silt size particles is :

(A) 4.75 mm to 2.00 mm

(B) 2.00 mm to 0.425 mm

(C) 0.425 mm to 0.075 mm

(D) 0.075 mm to 0.002 mm

49. Void ratio of soil mass can :

(A) Take any value greater than zero

(B) Be zero

(C) Never be greater than unity

(D) Take values between 0 and 1 only

50. Relative density of a compacted dense sand is approximately equal to :

(A) 0.4

(B) 0.6

(C) 0.95

(D) 1.2

51. According to Terzaghi's theory, the ultimate bearing capacity at the ground surface for a purely cohesive soil with cohesion c and for a smooth base of a strip footing is :

(A) 2.57 c

(B) 5.14 c

(C) 6.2 c

(D) 5.7 c

52. Select the correct statement :

(A) Both negative skin friction and skin frictional resistance are caused by relative settlement of soil

(B) Both negative skin friction and skin frictional resistance are caused by relative settlement of pile

(C) Negative skin friction is caused by relative settlement of soil and skin frictional resistance is caused by relative settlement of pile

(D) Negative skin friction is caused by relative settlement of pile and skin frictional resistance is caused by relative settlement of soil

53. Taylor's stability number is given by :

(A) $\frac{F_c}{c\gamma H}$

(B) $\frac{\gamma H}{cF_c}$

(C) $\frac{c}{F_c\gamma H}$

(D) $\frac{H}{cF_c\gamma}$

54. Sand stone is :

(A) Sedimentary rock

(B) Metamorphic rock

(C) Igneous rock

(D) Volcanic rock

55. The stress which is responsible for retaining water in capillary tube above the free water surface of the water body in which the capillary tube is inserted, is :

(A) Capillary compression

(B) Capillary tension

(C) Capillary pore pressure

(D) None of the above

56. The effective size of particles of soil is denoted by :

(A) $D_{10}$

(B) $D_{20}$

(C) $D_{30}$

(D) $D_{60}$

57. The ultimate settlement of a soil is directly proportional to :

(A) Depth of the compressible soil strata

(B) Compressive index

(C) Void ratio

(D) Both (A) and (B)

58. A coarse-grained soil has a voids ratio 0.75 and specific gravity as 2.75. The critical gradient at which quick sand condition occurs, is :

(A) 0.25

(B) 0.50

(C) 0.75

(D) 1.00

59. Buoyant unit weight equals the saturated density :

(A) Multiplied by unit weight of water

(B) Divided by unit weight of water

(C) Plus unit weight of water

(D) Minus unit weight of water

60. A phreatic line is defined as the line within a dam section below which there are :

(A) Positive equipotential lines

(B) Positive hydrostatic pressure

(C) Negative hydrostatic pressure

(D) Negative equipotential lines

61. The minimum centre to centre distance of friction piles of 1 m diameter, is :

(A) 1.0 mm

(B) 2.0 mm

(C) 3.0 m

(D) 4.0 m

62. Stoke's law does not hold good if the size of particle is smaller than :

(A) 0.0002 mm

(B) 0.002 mm

(C) 0.02 m

(D) 0.2 m

63. The ultimate bearing capacity of a soil, is :

(A) Load at which soil consolidates

(B) Load at which soil fails

(C) Total load on the bearing area

(D) Safe load on the bearing area

64. Raft foundation are generally preferred to when the area required for individual footing, is more than :

(A) 25% of total area

(B) 30% of total area

(C) 40% of total area

(D) 50% of total area

65. The arrangement of supporting an existing structure by providing supports underneath, is known as :

(A) Shoring

(B) Underpinning

(C) Jacking

(D) Piling

66. The most efficient traffic signal is :

(A) Simultaneous system

(B) Flexible progressive system

(C) Simple progressive system

(D) Alternate system

67. The rate of rise or fall of the road surface along its length is called :

(A) Cant

(B) Super-elevation

(C) Gradient

(D) Banking

68. In hill roads, the minimum sight distance required is :

(A) Stopping sight distance

(B) Passing sight distance

(C) Braking distance

(D) None of the above

69. Which of the following methods is recommended by IRC for the design of flexible pavement ?

(A) Group index method

(B) CBR method

(C) Westergaard method

(D) None of the above

70. The Indian Railway has been divided into :

(A) Six zones

(B) Eight zones

(C) Twelve zones

(D) Sixteen zones

71. Which of the following sleepers provide the best elasticity of track ?

(A) Wooden sleeper

(B) Cast iron sleeper

(C) Steel sleeper

(D) RCC sleeper

72. Maximum super-elevation on hill roads should not exceed :

(A) 5%

(B) 7%

(C) 8%

(D) 10%

73. The type of transition curves generally provided on hill roads, is :

(A) Circular

(B) Cubic parabola

(C) Spiral

(D) Lemniscate

74. The road foundation for modern highways construction, was developed by :

(A) Tresgue

(B) Telford

(C) Telford and Macadam simultaneously

(D) Macadam

75. Coning of wheels is provided :

(A) To check lateral movement of wheels

(B) To avoid damage to inner faces of rails

(C) To avoid discomfort to passengers

(D) All of the above

76. For a vehicle moving with a speed of 80 km per hour, the brake reaction time, in ordinary cases, is :

(A) 1 sec

(B) 1.5 sec

(C) 2.0 sec

(D) 2.5 sec

77. Bull headed rails are generally provided on :

(A) Points and crossing

(B) Straight tangents

(C) Curved tracks

(D) Meter gauge tracks

78. Width of vehicles affects the width of :

(A) Lanes

(B) Shoulders

(C) Parking spaces

(D) All of the above

79. The maximum safe speed on roads, depends on the :

(A) Type of the highway

(B) Type of the road surface

(C) Type of curves

(D) All of the above

80. The head of Public Works Department of any Indian state is :

(A) Transport Minister

(B) Chief Engineer

(C) Superintending Engineer

(D) Executive Engineer

81. The optical square is used to measure angles by :

(A) Refraction

(B) Reflection

(C) Double refraction

(D) Double reflection

82. When the magnetic declination is $5^{\circ}\,20'$ east, the magnetic bearing of the sun is at noon will be :

(A) $95^{\circ}\,20'$

(B) $174^{\circ}\,40'$

(C) $185^{\circ}\,20'$

(D) $354^{\circ}\,40'$

83. A line joining the point of intersection of the cross-hairs of the diaphragm and the optical center of the object glass, is known as :

(A) Fundamental line

(B) Axis of telescope

(C) Axis of level tube

(D) Line of collimation

84. The error which is not completely eliminated in reciprocal leveling, is :

(A) Error due to curvature

(B) Error due to refraction

(C) Error due to non-adjustment of line of collimation

(D) Error due to non-adjustment of bubble tube

85. The contour lines can cross one another on map only in the case of :

(A) An overhanging cliff

(B) A valley

(C) A ridge

(D) A vertical cliff

86. A curve of varying radius is known as :

(A) Varying curve

(B) Compound curve

(C) Transition curve

(D) Reverse curve

87. The method of finding out the difference in elevation between two points for eliminating the effect of curvature and refraction, is :

(A) Precise leveling

(B) Differential leveling

(C) Reciprocal leveling

(D) Fly leveling

88. The horizontal angle between true meridian and magnetic meridian, is known as :

(A) Convergence

(B) Magnetic declination

(C) Bearing

(D) Dip

89. A relatively fixed point of known elevation above datum, is called :

(A) Bench mark

(B) Datum point

(C) Reduced level

(D) Reference point

90. The curvature of the Earth's surface, is taken into account only if the extent of survey is more than :

(A) 100 sq km

(B) 160 sq km

(C) 200 sq km

(D) 260 sq km

## SPACE FOR ROUGH WORK

SEAL