MIZORAM PUBLIC SERVICE COMMISSION

TECHNICAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO THE POST OF ASSISTANT ENGINEER (CIVIL) UNDER TOURISM DEPARTMENT, GOVERNMENT OF MIZORAM, FEBRUARY - 2020.

TECHNICAL PAPER - III

Time Allowed : 2 hours FM : 200

All questions carry equal mark of 2 each.
Attempt all questions.

1. Terzaghi's theory of one dimensional consolidation assumes
(a) Soil is homogenous and fully saturated
(b) Deformation of the soil is entirely due to change in volume
(c) Water and soil particles are incompressible
(d) All the above

2. The submerged density of soil is given by

(a) $\frac{\gamma_w (G+1)}{1+e}$ (b) $\frac{\gamma_w (G-1)}{1+e}$

(c) $\frac{\Upsilon_w (G+1)}{e}$ (d) $\frac{\gamma_w (G+1)}{1-e}$

3. A soil having particles of nearly the same size is known as
(a) Poorly graded (b) Well graded
(c) Uniformly graded (d) Gap graded

4. A soil has a bulk density of 22 KN/m^3 and water content of 10%. The dry density of soil is
(a) 17.0 KN/m^3 (b) 18.0 KN/m^3
(c) 20 KN/m^3 (d) 22.0 KN/m^3

5. The shear strength of a soil
(a) Directly proportional to the angle of internal friction
(b) Inversely proportional to the angle of internal friction
(c) Decreases with increase in normal stress
(d) Decreases with decrease in normal stress

6. Effective stress on soil
(a) Increases voids ratio and decreases permeability
(b) Increases both voids ratio and permeability
(c) Decrease void ratio and increases permeability
(d) Decreases both void ratio and permeability

7. Relative density of a compacted dense sand is approximately equal to
(a) 0.4 (b) 0.6
(c) 0.95 (d) 1.20

8. Which of the following is a measure of particle size range

(a) Effective size (b) Uniformity coefficient

(c) Coefficient of curvature (d) Sieve analysis

9. According to Atterberg, the soil is classified as medium plasticity if plasticity index (PI) is

(a) $0 < PI < 7$ (b) $7 \leq PI \leq 17$

(c) $17 < PI < 27$ (d) $PI \geq 27$

10. The sample of the soil has the following properties, find the Consistency index
Liquid limit = 45%
Plastic limit = 25%
Shrinkage limit = 17%
Natural moisture content = 30%

(a) 15/20 (b) 13/20

(c) 8/20 (d) 5/20

11. Coefficient of consolidation of a soil is affected by

(a) Compressibility (b) Permeability

(c) Both Compressibility and Permeability (d) None of these

12. Westergaard's analysis for stress distribution beneath a loaded areas is applicable to

(a) Sandy soil (b) Clayey soil

(c) Silty soil (d) Stratified soil

13. The upstream slope of an earth dam under steady seepage condition is

(a) Equipotential lines (b) Phreatic line

(c) Water table (d) Seepage line

14. Total lateral earth pressure is proportional to

(a) Depth of soil (b) Square of depth of soil

(c) Angle of internal friction (d) None of the above

15. Rankine's theory of earth pressure assumes that back of the wall is

(a) Plane and smooth (b) Plane and rough

(c) Vertical and smooth (d) Vertical and rough

16. Toughness index is defined as the ratio of

(a) Plasticity index to consistency index (b) Plasticity index to flow index

(c) Liquidity index to flow index (d) Consistency index to liquidity index

17. A partially saturated soil sample has unit weight of 2 g/cm^3, specific gravity of 2.6 and moisture content 20%. The degree of saturation is

(a) 98 % (b) 95 %

(c) 92 % (d) 89 %

18. Under-reamed piles are generally

(a) Driven piles (b) Precast piles

(c) Cast insitu piles (d) Bored piles

19. The sudden loss of shear strength by saturated soil mass under external forces where the soil behave as fluid is called

(a) Liquefaction (b) Piping of soil

(c) Quick condition (d) mud slide

20. Undisturbed soil samples are required for conduction
(a) Shrinkage limit test
(b) Consolidation test
(c) Specific gravity test
(d) Proctor test

21. The error due to bad ranging is
(a) Cumulative positive
(b) Cumulative negative
(c) Compensating
(d) Cumulative positive or negative

22. The principle of "working from whole to part" is used in surveying because
(a) Plotting becomes easy
(b) Surveying work is faster
(c) Accumulation of errors prevented
(d) All of these

23. The maximum tolerance in 20 m chain is
(a) 5 1.5 mm
(b) 5 2.5 mm
(c) 5 3 mm
(d) 5 5 mm

24. The representative fraction 1/2500 means that the scale is 1 cm equal to
(a) 0.25 m
(b) 2.5 m
(c) 25 m
(d) 250 m

25. Contour interval on a map sheet denotes
(a) Vertical distance of contour lines above the datum plane
(b) Vertical distance between two successive contour lines
(c) Slope distance between two successive contour lines
(d) Horizontal distance between two successive contour lines

26. The radius of curvature of an ideal transition curve is
(a) Inversely proportional to its length from the beginning
(b) Directly proportional to its length from the beginning
(c) Proportional to the superelevation
(d) None of these

27. For simple circular curve for 20 m arc length which one is the correct relation
(a) R = 5729.6/D
(b) R = 1718.9/D
(c) R = 1145.9/D
(d) R = 572.9/D

28. The instrument used for accurate centering in plane table surveying is
(a) Trough compass
(b) Peg
(c) Alidade
(d) Plumbing fork

29. The resection by two point problem as compared to three point problem
(a) More accurate
(b) Lesser time
(c) More laborious
(d) Easier

30. The vertical staff intercept is 0.65 m from tacheometer, the horizontal distance between the staff and tacheometer is
(a) 0.65 m
(b) 6.5 m
(c) 65 m
(d) 650 m

31. Intersection method of detailed plotting is most suitable for
(a) Hilly areas
(b) Forest
(c) Urban areas
(d) plains

32. Horizontal distances obtained by tacheometric observations

(a) Require slope correction

(b) Require tension correction

(c) Require slope and tension correction

(d) Do not require slope and tension correction

33. Which of the following sights are taken on a "turning point"

(a) Foresight only (b) Backsight only

(c) Foresight and Backsight (d) Foresight and intermediate sight

34. The rate of payment is made for 100 m^3 (per % m^3) in case of

(a) Earth work in excavation (b) Rock cutting

(c) Excavation in trenches for foundation (d) All of these

35. A cement concrete road is 1 km long and 8 m wide and 25 cm thick over the sub-base of 10 cm gravel. The box cutting in road crust is

(a) 500 m^3 (b) 1000 m^3

(c) 1500 m^3 (d) 2000 m^3

36. While estimating the qualities for the construction of a building, the correct metric unit is

(a) Cubic meter for area (b) Liter for capacity

(c) Square meter for volume (d) Meter per cubic meter

37. In long and short wall method of estimation, the long wall is the center to center distance between the walls and

(a) Breadth of the wall (b) Half breadth of wall on each side

(c) One fourth breadth of wall on each side (d) None of these

38. The most reliable estimate is

(a) Detailed estimate (b) Cube rate estimate

(c) Plinth area estimate (d) Preliminary estimate

39. The minimum width of a septic tank is taken as

(a) 70 cm (b) 75 cm

(c) 80 cm (d) 90 cm

40. The item of steel work which is measured in sq.m, is

(a) Collapsible gates (b) Rolling shutters

(c) Ventilators and glazing (d) All of these

41. As per ICAO, all markings on the airport runways are

(a) Yellow (b) White

(c) Black (d) Red

42. In approach areas of runways equipped with instrumental landing facilities any object within 4.5 km distance from runway end shall be considered obstruction if the height is above

(a) 20 m (b) 30 m

(c) 45 m (d) 55 m

43. When a ship floats at its designed water line, the vertical distance from water line to the bottom of the ship is known as

(a) Beam (b) Depth

(c) Freeboard (d) Draft

44. Which of the following type of sea walls results in greatest protection of shore structures

(a) Sea wall with concave face
(b) Vertical sea wall
(c) Sea wall with batter
(d) Stepped sea wall

45. In railway the standard length of rail for Broad gauge and Meter gauge respectively are

(a) 12 m and 13 m respectively
(b) 12 m and 12 m respectively
(c) 13 m and 12 m respectively
(d) 13 m and 13 m respectively

46. Due to battering action of wheels over the end of the rails, the rails get bent down and deflected at the end, these rails are termed as

(a) Buckled rails
(b) Hogged rails
(c) Corrugated rails
(d) Bent rails

47. The specified width of ballast section for Broad gauge is

(a) 1.83 m
(b) 2.25 m
(c) 3 m
(d) 3.35 m

48. Creep in rails is

(a) Longitudinal movement of rail
(b) Lateral movement of rail
(c) Vertical movement of rail
(d) Difference in level of two rails

49. The most suitable soil for compressed air tunneling is

(a) Silt
(b) Sand
(c) Clay
(d) Gravel

50. Drift method of tunneling is used to construct tunnels in

(a) Soft ground
(b) Rocks
(c) Broken ground
(d) Self supporting ground

51. For water bound macadam roads in heavy rainfall areas, the recommended camber value is

(a) 1 in 20
(b) 1 in 25
(c) 1 in 30
(d) 1 in 36

52. The ruling design speed on National Highway in plain terrain as per IRC is

(a) 60 km/hr
(b) 80 km/hr
(c) 100 km/hr
(d) 120 km/hr

53. The maximum design gradient for vertical profile of a road is

(a) Ruling gradient
(b) Limiting gradient
(c) Hill gradient
(d) Minimum gradient

54. Which of the following binders is recommended for a wet and cold climate

(a) Tar
(b) 80/100 penetration asphalt
(c) Cutback
(d) Emulsion

55. Reflection cracking is observed in

(a) Flexible pavement
(b) Rigid pavement
(c) Bituminous overlay over concrete surface
(d) Rigid overlay over flexible pavement

56. Which one of the following causes raveling in bituminous pavement

(a) Use of soft bitumen
(b) Excessive bitumen content
(c) Low bitumen content
(d) Use of open graded aggregate

57. The distance travelled by a moving vehicle during perception and brake reaction times, is known as
(a) Lag distance (b) Stopping distance
(c) Sight distance (d) None of these

58. Stability of hill slope depends on
(a) Angle of slope (b) Geological condition
(c) Groundwater conditions (d) All of these

59. The safe stopping distance may be calculated from the equation
(a) $D = 0.254Vt + \frac{V^2}{278f}$ (b) $D = 0.278Vt + \frac{V^2}{254f}$
(c) $D = 0.254Vt + \frac{V^2}{225f}$ (d) $D = 0.225Vt + \frac{V^2}{254f}$

60. Enoscope is used to find
(a) Average speed (b) Space mean speed
(c) Spot speed (d) Time mean speed

61. The estimated time required to perform an activity is known as
(a) Event (b) Dummy
(c) Duration (d) Float

62. In CPM analysis
(a) Emphasis is given to activities (b) Uncertainties are not allowed
(c) Activities are represented by arrows (d) All of these

63. If t is the duration of activity, t_1 = latest finish possible moments of its preceding activity and t_2 is the earliest start possible moment, the independent float of the activity is
(a) $t-(t_1-t_2)$ (b) $t+(t_1-t_2)$
(c) $(t_1-t_2) - t$ (d) $(t_1+t_2) - t$

64. The probability of completion of any activity within its expected time is
(a) 40 % (b) 50%
(c) 80 % (d) 90 %

65. Critical path lies along the activity having total float
(a) Zero (b) Equal activity
(c) Positive (d) Negative

66. Milestone chart
(a) Shows the interdependencies of various jobs
(b) Show key events and map forward movement in jobs
(c) Depicts delay in jobs
(d) Points outgoing ahead of schedule of jobs

67. Rolling resistance of a wheel depends upon
(a) Vehicle load and grade of road (b) Vehicle type and loading
(c) Vehicle load and ground condition (d) All of these

68. The most suitable type of equipment for compaction of cohesive soils is
(a) Smooth wheeled rollers (b) Vibratory rollers
(c) Tampers (d) Sheep foot rollers

69. If x is the optimistic time, y pessimistic time and z most likely time of an activity, the expected time of the activity, is

(a) $(x + z + y)/6$ (b) $(x + 2z + y)/6$

(c) $(x + 4z + y)/6$ (d) $(x + 6z + y)/6e$

70. Sinking fund is

(a) Raised to meet maintenance cost

(b) Fund kept for providing additional structures

(c) Amount of money to be paid to municipality by tenant

(d) Fund for rebuilding a structure when its economic life is over

71. The first stage of construction is

(a) Preparation of estimate (b) Initiation of proposal

(c) Site selection (d) Inviting tender

72. The area under the Beta distribution curve is divided into two equal parts by

(a) Expected time (b) Most likely time

(c) Pessimistic time (d) Optimistic time

73. If an activity has its optimistic, most likely and pessimistic times as 2, 3 and 7 respectively, then its expected time is

(a) 2.5 (b) 3

(c) 3.5 (d) 5

74. Which of the following surfaces will give highest rolling resistance for rubber tyred vehicle

(a) Concrete (b) Loose sand

(c) Asphalt (d) Firm earth

75. Which of the following is not an excavating and moving type equipment

(a) Bulldozer (b) Clam shell

(c) Scrapper (d) Dump truck

76. The process of incorporating changes and rescheduling or replanning is called

(a) Updating (b) Resource levelling

(c) Resource smoothening (d) Critical path scheduling

77. Mobilization advance up to 10% of the cost of work is given to contractor

(a) On the commencement of work at site

(b) For the purchase of construction materials

(c) For advance payment to labour and other staff

(d) For all activities to start the work at site on finalization of contract

78. Which of the following is most suitable for digging under water

(a) Drag line (b) Hoe

(c) Clamp shell (d) Dipper shovel

79. Security deposit deducted at 5% from contractor's bill is

(a) Refunded when the contractor has completed the work

(b) Event refunded before completion of work if good progress is made

(c) Retained till expected life time of structure

(d) Refunded when defect and liability period of six months is over

80. For masonry work with solid bricks, consistency of mortar should be

(a) 3 – 5 cm (b) 5 – 8 cm

(c) 9 – 13 cm (d) 13 – 18 cm

81. In brick masonry the bond produced by laying alternated headers and strechers in each course is

(a) English bond (b) Double Flemish bond

(c) Zigzag bond (d) Single Flemish bond

82. Expansion joints in masonry walls are provided in wall length greater than

(a) 10 m (b) 20 m

(c) 30 m (d) 40 m

83. The slenderness ratio for masonry walls should not be more than

(a) 5 (b) 10

(c) 20 (d) 30

84. If the actual thickness of masonry wall is 19 cm, effective length 2.70 m and effective height 2.82 m and stiffening coefficient is 1.2, the slenderness ratio of the wall for design is

(a) 11.8 (b) 12.4

(c) 14.2 (d) 14.8

85. For designing masonry components of structure, seismic forces provision is not necessary in building construction in

(a) Zone I only (b) Zone I and II

(c) Zone I, II and III (d) Zone I, II, III and IV

86. Water retentivity for brick masonry should not be less than

(a) 50 % (b) 60 %

(c) 70 % (d) 80 %

87. Where a structural component or a system is providing lateral support to five or more walls or column the lateral load to be resisted may be taken as

(a) 4 % (b) 5 %

(c) 6 % (d) 7 %

88. Which of the following is very useful equipment to clear site of work and to make the land level

(a) Bulldozer (b) Scraper

(c) Grader (d) Excavator

89. The precise control of excavation is possible by

(a) Scrapper (b) Hoe

(c) Clamp shell (d) Bulldozer

90. The compaction of sand is done by

(a) Rollers (b) Vibrator

(c) Shovel (d) Jetting

91. In big construction work to raise and shift heavy loads from one place to another, we use

(a) Conveyor (b) Cranes

(c) Truck (d) Dump truck

92. The first method invented for planning projects was

(a) Milestone chart (b) CPM

(c) Bar chart method (d) PERT

93. Which process during concreting comes after batching in manufacturing process

(a) Transportation (b) Placing

(c) Mixing (d) Compacting

94. How many types of concrete batching are there

(a) 1 (b) 2

(c) 3 (d) 4

95. What is the maximum height through which concrete can be poured

(a) 0.1 – 0.6 m (b) 0.8 – 1 m

(c) 1.5 m (d) 2 m

96. Excessive vibration during concrete compaction can lead to

(a) High strength (b) Bleeding

(c) Air bubbles (d) Segregation

97. Which is the best method for curing concrete flat surfaces

(a) Spraying water (b) Placing wet gunny bag

(c) Applying curing chemicals (d) Stagnating water

98. Direct load carrying capacity of a brick masonry wall standing freely against when supports RC slab will be

(a) More (b) Less

(c) Does not change (d) 100%

99. Rich mortar are more likely to develop crack compared to lean mortar because

(a) More strength (b) High shrinkage

(c) Loss of strength (d) None of these

100. Sand in the mortar is needed for

(i) decreasing the quantity of cement

(ii) reducing shrinkage

(iii) decreasing the surface area of binding material

(iv) increasing strength

Of these statement, chose the correct one

(a) ii, iii and iv are correct (b) i, iii and iv are correct

(c) i, ii and iii are correct (d) i, ii and iv are correct

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