MIZORAM PUBLIC SERVICE COMMISSION

TECHNICAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO THE POST OF
ASSISTANT SOIL CONSERVATION ENGINEER (ASCE)
UNDER LAND RESOURCES, SOIL & WATER CONSERVATION DEPARTMENT
GOVERNMENT OF MIZORAM. FEBRUARY, 2021

CIVIL ENGINEERING PAPER - III

Time Allowed : 2 hours   Full Marks : 200

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

1. Different grades are joined together by a:
   (a) Compound curve   (b) Transition curve
   (c) Reverse curve   (d) Vertical curve

2. The line of collimation method of reduction of levels, does not provide a check on:
   (a) Intermediate sights   (b) Fore sights
   (c) Back sights   (d) Reduced levels

3. Contour interval is:
   (a) Inversely proportional to the scale of the map (b) Directly proportional to the flatness of ground
   (c) Larger for accurate works (d) Larger if the time available is more

4. The smaller horizontal angle between the true meridian and a survey line, is known:
   (a) Declination   (b) Bearing
   (c) Azimuth   (d) Dip

5. After fixing the plane table to the tripod, the main operations which are needed at each plane table station are:
    (i) Levelling   (ii) Orientation
   (iii) Centering
   The correct sequence of these operations is:
   (a) (i), (ii), (iii)   (b) (i), (iii), (ii)
   (c) (iii), (i), (ii)   (d) (ii), (iii), (i)

6. If the smallest division of a vernier is longer than the smallest division of its primary scale, the vernier is known as:
   (a) Direct vernier   (b) Double vernier
   (c) Retrograde vernier   (d) Simple vernier

7. In levelling operation:
   (a) When the instrument is being shifted, the staff must not be moved
   (b) When the staff is being carried forward, the instrument must remain stationary
   (c) Both (a) and (b)
   (d) Neither (a) nor (b)

8. The two point problem and three point problem are methods of:
   (a) Resection   (b) Orientation
   (c) Traversing   (d) Resection and orientation

9. In levelling operation:
   (a) If second reading is more than first, it represents a rise
   (b) If first reading is more than second, it represents a rise
   (c) If first reading is less than second, it represents a fall
   (d) Both (b) & (c)

10. Over-turning of vehicles on a curve can be avoided by using:
    (a) Compound curve
    (b) Vertical curve
    (c) Reverse curve
    (d) Transition curve

11. In levelling operation,
    (a) The first sight on any change point is a back sight
    (b) The second sight on any change point is a fore sight
    (c) The line commences with a fore sight and closes with a back sight
    (d) The line commences with a back sight and closes with a foresight

12. Transition curves are introduced at either end of a circular curve, to obtain:
    (a) Gradually decrease of curvature from zero at the tangent point to the specified quantity at the junction of the transition curve with main curve
    (b) Gradual increase of super-elevation from zero at the tangent point to the specified amount at the junction of the transition curve with main curve
    (c) Gradual change of gradient from zero at the tangent point to the specified amount at the junction of the transition curve with main curve
    (d) None of these

13. Bowditch rule is applied to:
    (a) An open traverse for graphical adjustment
    (b) A closed traverse for adjustment of closing error
    (c) Determine the effect of local attraction
    (d) None of the above

14. Straight, parallel and widely spaced contours represent
    (a) A steep surface
    (b) A flat surface
    (c) An inclined plane surface
    (d) Curved surface

15. A standard steel tape of length 30 m and cross-section 15×1.0 mm was standardised at 25°C and at 30 kg pull. While measuring a base line at the same temperature, the pull applied was 40 kg. If the modulus of elasticity of steel tape is 2.2×106 kg/cm2, the correction to be applied is:
    (a) - 0.000909 m
    (b) + 0.0909 m
    (c) 0.000909 m
    (d) None of these

16. The curve composed of two arcs of different radii having their centres on the opposite side of the curve, is known:
    (a) A simple curve
    (b) A compound curve
    (c) A reverse curve
    (d) A vertical curve

17. In geodetic surveys higher accuracy is achieved, if:
    (a) Curvature of the earth surface is ignored
    (b) Curvature of the earth surface is taken into account
    (c) Angles between the curved lines are treated as plane angles
    (d) None of these

18. The bearings of the lines AB and BC are 146° 30' and 68° 30'. The included angle ABC is:
    (a) 102°
    (b) 78°
    (c) 45°
    (d) None of these

19. The main factor to be considered while preparing a detailed estimate, is:
   - (a) Quantity of the materials
   - (b) Availability of materials
   - (c) Transportation of materials
   - (d) All the above

20. Brick walls are measured in sq. m if the thickness of the wall is:
   - (a) 10 cm
   - (b) 15 cm
   - (c) 20 cm
   - (d) None of these

21. The plinth area of a building not includes:
   - (a) Area of the walls at the floor level
   - (b) Internal shaft for sanitary installations up to 2 sq m. in area
   - (c) Lift and wall including landing
   - (d) Area of cantilevered porch

22. If the formation level of a highway has a uniform gradient for a particular length, and the ground is also having a longitudinal slope, the earthwork may be calculated by:
   - (a) Mid-section formula
   - (b) Trapezoidal formula
   - (c) Prismoidal formula
   - (d) All the above

23. A cement concrete road is 1000 m long, 8 m wide and 15 cm thick over the sub-base of 10 cm thick gravel. The box cutting in road crust is:
   - (a) 500 m³
   - (b) 1000 m³
   - (c) 1500 m³
   - (d) 2000 m³

24. The brick work is not measured in cu m in case of:
   - (a) One or more than one brick wall
   - (b) Brick work in arches
   - (c) Reinforced brick work
   - (d) Half brick wall

25. The area of the cross-section of a road fully in banking shown in the given figure, is:
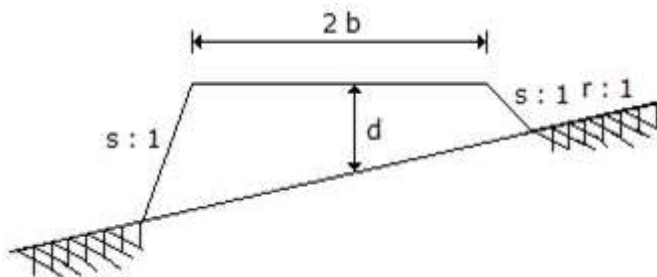

   - (a) $[sb^2 + r^2 (2bd + sd)^2]/(r^2 - s^2)$
   - (b) $[sb^2 + r^2 (2bd + sd)^2]/(r^2 - s5)$
   - (c) $[sb^2 + r^2 (2bd + sd)^2]/(r - s)$
   - (d) None of these

26. For full face method, the excavation to be done is generally divided into:
   - (a) two sections
   - (b) three sections
   - (c) four sections
   - (d) five sections

27. The value of 'B' of Indian type W.C. shown in the given figure is:
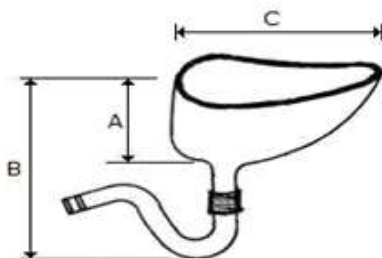

   - (a) 45 cm
   - (b) 50 cm
   - (c) 30 cm
   - (d) 25 cm

28. The cost of the earthwork in excavation for the surface drain of cross-section shown in the given figure for a total length of 5 metres @ Rs. 450 cum, is:
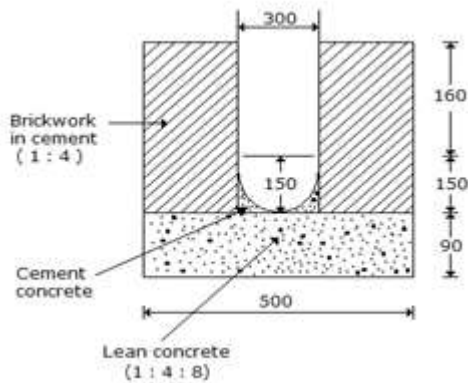

(a) Rs. 400   (b) Rs. 425

(c) Rs. 450   (d) Rs. 500

29. The total length of a cranked bar through a distance (d) at 45° in case of a beam of effective length L, is:

(a) L + 0.42 d   (b) L + (2 × 0.42 d)

(c) L - (0.42 d)   (d) L - (2 × 0.4 d)

30. Preliminary project report for a road project must contain:

(a) The detailed estimated cost based on detailed design

(b) The several alternatives of the project that have been considered

(c) The soil survey, traffic survey, concept design and approximate cost

(d) The contract documents for inviting tenders

31. The artificial activity which indicates that an activity following it, cannot be started unless the preceding activity is complete, is known as:

(a) Event   (b) Free float

(c) Dummy   (d) Constraint

32. The time by which a particular activity can be delayed without affecting the preceding and succeeding activities is known as:

(a) Total float   (b) Free float

(c) Interfering float   (d) Independent float

33. For the network shown in the given figure, the expected time for the activity:
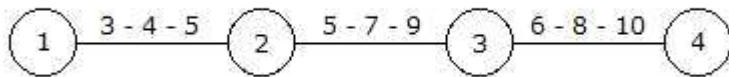
(a) 1-2 is 4   (b) 2-3 is 8

(c) 3-4 is 6   (d) All of these

34. For a given activity, the optimistic time, pessimistic time and the most probable estimates are 5, 17 and 8 days respectively, the expected time is:

(a) 8 days   (b) 9 days

(c) 10 days   (d) 15 days

35. A golden rule for the procurement of construction stones, suggests:

(a) 100% at the site   (b) 67% at the site and 33% under procurement

(c) 50% at the site and 50% under procurement   (d) 33% at the site and 67% under procurement

36. Optimistic time, most likely time and pessimistic times for the activities of a network in the given figure are written above their arrows. If the contractual obligation time for the project is 75, the latest occurrence time for the event 2, is:

$$1 \xrightarrow{15 - 28 - 21} 2 \xrightarrow{27 - 35 - 43} 3 \xrightarrow{12 - 15 - 16} 4$$
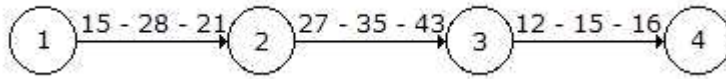
    (a) 20   (b) 25

    (c) 35   (d) 15

37. If t_o, t_p and t_m are the optimistic, pessimistic and most likely time estimates of an activity respectively, the expected time t of the activity will be:

    (a) $t_o + 3t_m + t_p/3$ (b) $t_o + 4t_m + t_p/4$

    (c) $t_o + 4t_m + t_p/5$ (d) $t_o + 4t_m + t_p/6$

38. PERT technique of network analysis is mainly useful for:

    (a) Small projects   (b) Large and complex projects

    (c) Research and development projects   (d) Deterministic activities

39. Which of the following is considered to be the highest quality construction in the group of black top pavements?

    (a) Mastic asphalt   (b) Sheet asphalt

    (c) Bituminous carpet   (d) Bituminous concrete

40. When the width of car parking space and width of street are limited, generally preferred parking system is:

    (a) Parallel parking   (b) 45° angle parking

    (c) 65° angle parking   (d) 90° angle parking

41. In the penetration macadam construction, the bitumen is:

    (a) Sprayed after the aggregates are spread and compacted

    (b) Premixed with aggregates and then spread

    (c) Sprayed before the aggregates are spread and compacted

    (d) None of these

42. The function of an expansion joint in rigid pavements is to:

    (a) Relieve warping stresses   (b) Relieve shrinkage stresses

    (c) Resist stresses due to expansion   (d) Allow free expansion

43. In soils having same values of plasticity index, if liquid limit is increased, then:

    (a) Compressibility and permeability decrease and dry strength increases

    (b) Compressibility, permeability and dry strength decrease

    (c) Compressibility, permeability and dry strength increase

    (d) Compressibility and permeability increase and dry strength decreases

44. The ideal shape of a transition curve, is:

    (a) Clothoid   (b) Cubic spiral

    (c) Cubic parabola   (d) Lamniscate

45. The full width of land acquired before finalising a highway, alignment is known:

    (a) Width of formation   (b) Right of way

    (c) Carriage way   (d) Roadway

46. The most suitable equipment for compacting clayey soils is a:

    (a) Smooth wheeled roller   (b) Pneumatic tyred roller

    (c) Sheep foot roller   (d) Vibrator

47. Selection of the routes, of highways depends upon:
   - (a) Feasibility of attaining ruling gradient
   - (b) Avoidance of cutting hard rocks
   - (c) Minimum number of bridges
   - (d) All of these

48. Traffic rotary is justified where:
   - (a) Number of intersecting roads is between 4 and 7
   - (b) Space is limited and costly
   - (c) When traffic volume is less than 500 vehicles per hour
   - (d) When traffic volume is more than 5000 vehicles per hour

49. If aggregate impact value is 20 to 30 percent, then it is classified as:
   - (a) Exceptionally strong
   - (b) Strong
   - (c) Satisfactory for road surfacing
   - (d) Unsuitable for road surfacing

50. Set-back distance is the distance between:
   - (a) Road land boundary and building line
   - (b) Road land boundary and control line
   - (c) Building line and control line

51. If the coefficient of friction on the road surface is 0.15 and a maximum super-elevation 1 in 15 is provided, the maximum speed of the vehicles on a curve of 100 metre radius, is:
   - (a) 32.44 km/hour
   - (b) 42.44 km/hour
   - (c) 52.44 km/hour
   - (d) 62.44 km/hour

52. The length of a transition curve, is governed by:
   - (a) Rate of change of radial acceleration
   - (b) Rate of change of super-elevation
   - (c) Both (a) and (b)
   - (d) Neither (a) nor (b)

53. While filling the tender for any work, the contractor considers:
   - (a) Site survey
   - (b) Availability of construction materials
   - (c) Availability of labour
   - (d) All the above

54. The method of design of flexible pavement as recommended by IRC is:
   - (a) Group index method
   - (b) CBR method
   - (c) Westergaard method
   - (d) Benkelman beam method

55. Tie bars in cement concrete pavements are at:
   - (a) Expansion joints
   - (b) Contraction joints
   - (c) Warping joints
   - (d) Longitudinal joints

56. The total value of extra widening required at a horizontal curve on a two lane hill road of radius 42 m for a design speed of 50 kmph and for vehicles with wheel base 6 m, is:
   - (a) 0.500 m
   - (b) 0.589 m
   - (c) 1.089 m
   - (d) 0.089 m

57. As per IRC recommendations, the average level of illumination on important roads carrying fast traffic is:
   - (a) 10 Lux
   - (b) 15 Lux
   - (c) 20 Lux
   - (d) 30 Lux

58. Over taking time required for a vehicle with design speed 50 km ph and overtaking acceleration 1.25 m/sec^2 to overtake a vehicle moving at a speed 30 km ph, is:
   - (a) 5.0 secs
   - (b) 6.12 secs
   - (c) 225.48 secs
   - (d) 30 secs

59. The group index for a soil, whose liquid limit is 40 percent, plasticity index is 10 percent and percentage passing 75 micron IS sieve:
   - (a) 0
   - (b) 3
   - (c) 5
   - (d) 7

60. Cant deficiency occurs when a vehicle travels around a curve at:

    (a) Equilibrium speed   (b) Speeds higher than equilibrium speed

    (c) Speeds lower than equilibrium speed   (d) Booked speed

61. Composite sleeper index is the index of:

    (a) Hardness and strength   (b) Strength and toughness

    (c) Toughness and wear resistance   (d) Wear resistance and hardness

62. High pressure grouting is generally restored for concreting in the lining if the rock strata are:

    (a) highly fissured   (b) poor

    (c) likely to get seepage of water   (d) All of the above

63. In a diamond crossing, numbers of noses are:

    (a) 2   (b) 3

    (c) 4   (d) 6

64. The following tests are conducted for rails:

    (i) Falling weight test   (ii) Tensile test

    (iii) Hammer test

The compulsory tests are:

    (a) Only (i)   (b) (i) and (ii)

    (c) (ii) and (iii)   (d) (i) and (iii)

65. The sleepers which satisfy the requirements of an ideal sleeper are:

    (a) Cast iron sleepers   (b) R.C.C. sleepers

    (c) Steel sleepers   (d) Wooden sleepers

66. The maximum degree of curvature for Meter Gauge is limited to:

    (a) 10°   (b) 16°

    (c) 30°   (d) 40°

67. For supersonic transport aircraft, the minimum turning radius of taxiway is:

    (a) 60 m   (b) 120 m

    (c) 180 m   (d) 240 m

68. Which of the following is used for servicing and repairs of the aircraft?

    (a) Apron   (b) Hanger

    (c) Terminal building   (d) Holding apron

69. The length of runway under standard conditions is 2000 m. The elevation of airport site is 300 m. Its reference temperature is 33.05°C. If the runway is to be constructed with an effective gradient of 0.25 percent, the corrected runway length will be:

    (a) 2500 m   (b) 2600 m

    (c) 2700 m   (d) 2800 m

70. For the proposed air port, the survey project provides:

    (a) Master plan   (b) Topographic plan

    (c) Grading plan   (d) All of these

71. The length of runway is increased per 300 m rise above M.S.L.

    (a) 3 %   (b) 4 %

    (c) 5 %   (d) 7 %

72. The thickness design of the pavement, is decided on the load carried by:

    (a) Main gears   (b) Nose wheel

    (c) Tail wheel   (d) All of these

73. The runway orientation is made so that landing and takeoff are:

    (a) Against the wind direction   (b) Along the wind direction

    (c) Perpendicular to wind direction   (d) None of these

74. Rich cement mortars are more liable to cracking as compared to lean mortars because rich mortars have:

    (a) High shrinkage   (b) Less strength

    (c) Both (a) and (b)   (d) None of these

75. For designing masonry components of a structure, seismic forces provision in the design calculation is not necessary for buildings constructed in:

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

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

76. A 200 mm thick wall made of modular bricks is 5 m long between cross walls and 3.8 m clear height between RCC slabs at top and bottom. The slenderness ratio of the wall is:

    (a) 15   (b) 19

    (c) 20   (d) 25

77. Consider the following statements:

    1. Masonry in rich cements mortar though having good strength with high shrinkage is much liable for surface cracks.

    2. Lime mortar possesses poor workability and poor water retentivity and also suffers high shrinkage.

    3. Masonry in lime mortar has better resistance against rain penetration and is less liable to crack when compared to masonry in cement mortar. Which of these statements are correct?

    (a) 1, 2 and 3   (b) 1 and 2

    (c) 2 and 3   (d) 1 and 3

78. For strengthening a 50 m long and 5 m high straight compound wall built in brick work, which one of the following would be most suitable?

    (a) Providing buttresses at certain intervals   (b) Providing a deeper foundation

    (c) Using a richer mortar   (d) Using stronger bricks

79. Rise of water table above the ground surface causes:

    (a) Equal increase in pore water pressure and total stress

    (b) Equal decrease in pore water pressure and total stress

    (c) Increase in pore water pressure but decrease in total stress

    (d) Decrease in pore water pressure but increase in total stress

80. The shear strength of a soil:

    (a) is directly proportional to the angle of internal friction of the soil

    (b) is inversely proportional to the angle of internal friction of the soil

    (c) Decreases with increase in normal stress

    (d) Decreases with decrease in normal stress

81. Effective stress on soil:

    (a) Increases voids ratio and decreases permeability

    (b) Increases both voids ratio and permeability

    (c) Decreases both voids ratio and permeability

    (d) Decreases voids ratio and increases permeability

82. The angle of internal friction, is least for:

    (a) Angular-grained loose sand   (b) Angular -grained dense sand

    (c) Round-grained loose sand   (d) Clays

83. Rankine's theory of active earth pressure assumes:
    (a) Soil mass is homogeneous, dry and cohesionless
    (b) Ground surface is a plane which may be horizontal or inclined
    (c) Back of the wall is vertical and smooth
    (d) All of these

84. 260 g of wet soil was taken in a pycnometer jar of weight 400 g in order to find the moisture content in the soil, with specific gravity of soil particles 2.75. The weight of soil and remaining water filled in pycnometer without air bubbles was 1415 g and the weight of pycnometer filled with water alone was 1275 g. The moisture content in the soil is:
    (a) 24.2 %
    (b) 18.2 %
    (c) 53.8 %
    (d) None of these

85. In a liquid limit test, the moisture content at 10 blows was 70% and that at 100 blows was 20%. The liquid limit of the soil, is:
    (a) 35 %
    (b) 50 %
    (c) 65 %
    (d) None of these

86. The soil moisture driven off by heat, is called:
    (a) Free water
    (b) Hydroscopic water
    (c) Gravity water
    (d) None of these

87. The change of moisture content of soils, changes the:
    (a) Value of the angle of repose
    (b) Amount of compaction required
    (c) Cohesive strength of soil
    (d) All of these

88. Bishop's method of stability analysis:
    (a) is more conservative
    (b) Neglects the effect of forces acting on the sides of the slices
    (c) Assumes the slip surface as an arc of a circle
    (d) All of these

89. If water content of a soil is 40%, G is 2.70 and void ratio is 1.35, the degree of saturation is:
    (a) 70 %
    (b) 75 %
    (c) 80 %
    (d) 85 %

90. Stoke's law is valid only if the size of particle is:
    (a) Less than 0.0002 mm
    (b) Greater than 0.2 mm
    (c) Between 0.2 mm and 0.0002 mm
    (d) All of these

91. The ratio of volume of voids to the total volume of soil mass is called:
    (a) Air content
    (b) Porosity
    (c) Percentage air voids
    (d) Voids ratio

92. Failure of a slope occurs only when total shear force is:
    (a) Equal to total shearing strength
    (b) Greater than total shearing strength
    (c) Less than total shearing strength
    (d) None of these

93. Pile foundations are generally preferred to for:
    (a) Bridge foundations
    (b) Sky scrapper buildings
    (c) Residential buildings
    (d) Runways

94. The rise of water table below the foundation influences the bearing capacity of soil mainly by reducing:
    (a) Cohesion and effective angle of shearing resistance
    (b) Cohesion and effective unit weight of soil
    (c) Effective unit weight of soil and effective angle of shearing resistance
    (d) Effective angle of shearing resistance

95. The total weight of a pycnometer with water and oven dried soil 20 (g) is 1600 g. The pycnometer filled with water alone weighs 1500 g. The specific gravity of the soil, is:
    (a) 1.0   (b) 1.5
    (c) 2.0   (d) 2.5

96. A sample of saturated soil has 30% water content and the specific gravity of soil grains is 2.6. The dry density of the soil mass in g/cm3, is:
    (a) 1.47   (b) 1.82
    (c) 1.91   (d) None of these

97. The maximum pressure which a soil can carry without shear failure, is called:
    (a) Safe bearing capacity   (b) Net safe bearing capacity
    (c) Net ultimate bearing capacity   (d) Ultimate bearing capacity

98. The method of draining in the tunnels, is generally known as:
    (a) foredrainage   (b) dewatering
    (c) permanent drainage   (d) all of these

99. For highways, tunnelling is preferred to if the open cut exceeds:
    (a) 10 metres depth   (b) 15 metres depth
    (c) 20 metres depth   (d) 25 metres depth

100. Forepoling method is generally adopted for tunnelling in:
    (a) soft ground   (b) firm ground
    (c) running ground   (d) None of these

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