MIZORAM PUBLIC SERVICE COMMISSION

TECHNICAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO THE POST OF ASSISTANT CONTROLLER OF MINES UNDER COMMERCE & INDUSTRIES DEPARTMENT GOVERNMENT OF MIZORAM, OCTOBER, 2022

PAPER - III (TECHNICAL)

Time Allowed : 3 hours

Full Marks : 200

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

1. Important parameter of a dust that governs its physiological effect is:
   - (a) Concentration of dust in air
   - (b) Shape and Size of dust
   - (c) Time of exposure
   - (d) All the above

2. According to Central Pollution Control Board (CPCB), which particulate size are responsible for causing greatest harm to human health?
   - (a) ≤ 2.5 micron
   - (b) ≤ 3.5 micron
   - (c) ≤ 4.5 micron
   - (d) ≤ 5.5 micron

3. Amongst the different sources of dust/air pollutions in opencast mines, the highest contribution is from:
   - (a) Mucking
   - (b) Vehicular traffic on haul road
   - (c) Blasting
   - (d) Drilling

4. The most common disease of miners due to their exposures to airborne respirable dust is:
   - (a) Leukemia
   - (b) Malaria
   - (c) Pneumoconiosis
   - (d) Hemorrhoid

5. The most common instrument used for dust sampling is:
   - (a) Velocity dust sample
   - (b) Accelerator dust sampler
   - (c) Gravimetric dust sampler
   - (d) Porosity dust sampler

6. If the number of persons employed in the mine is 500 then the quantity of water required is:
   - (a) 2000 lit
   - (b) 1000 lit
   - (c) 500 lit
   - (d) 1500 lit

7. Specific conductance is used in water analysis to indirectly estimate dissolved solids. The measurements used in the method accounts for:
   - (a) Cations only
   - (b) All ions
   - (c) Anions only
   - (d) Un-ionized species

8. What is the minimum level of illumination required to be provided (in Lux) at underground Electrical substation in Indian coal mines?
   - (a) 75 H, 50 V
   - (b) 50 H, 25 V
   - (c) 75 H, 40 V
   - (d) 100 H, 50 V

9. Suspended Particulate Matter (SPM) are solid or liquid having particulate size of:
   - (a) Less than 10 micron
   - (b) More than 10 micron
   - (c) Between 1-10 micron
   - (d) None of the above

10. What is the neutral pH?
    (a) 6.0   (b) 7.0
    (c) 7.5   (d) 8.0

11. When the open pit mines are refilled with the tailings is called as:
    (a) Pond storage   (b) Extraction
    (c) Beneficiation   (d) Processing

12. Noise is_____:
    (a) An unwanted sound   (b) An irritant
    (c) A source of stress   (d) all of the above

13. In which unit sound is measured?
    (a) Kilometer   (b) Pascal
    (c) Kilogram   (d) Decibel

14. The 'temperature inversion' of the atmosphere in surface mines aggravates the problem of:
    (a) airborne dust   (b) noise
    (c) ground vibrations   (d) visibility

15. Following scale is used for loudness of sound or noise:
    (a) Linear scale   (b) Logarithmic scale
    (c) Exponential scale   (d) None of the above

16. Carbon monoxide has more affinity with haemoglobin than oxygen for about:
    (a) 2000 times   (b) 100 times
    (c) 210 times   (d) 20 times

17. Which of the following is not a physical characteristic of mine water pollution?
    (a) Colour   (b) pH
    (c) Odour   (d) Temperature

18. In an opencast mine two different noise sources added i.e. 60 dB + 60 dB then what will be the resultant noise level in that area?
    (a) 120 dB   (b) 63 dB
    (c) 3600 dB   (d) 69 dB

19. An electric cap lamp as used in mines has a fuse of capacity:
    (a) 1 amp   (b) 2 amp
    (c) 3 amp   (d) 4 amp

20. Which of the following are major environmental issues involved in mining?
    (a) Air pollution   (b) Water pollution
    (c) Soil degradation   (d) All of the above

21. The burning of fossil fuels releases a large amount of:
    (a) Nitrogen into air   (b) Sulphur into air
    (c) Carbon dioxide into air   (d) Oxygen into air

22. Main source of acid rain in Assam coal mine region is due to:
    (a) Sulphur dioxide   (b) Nitrogen
    (c) Carbon dioxide   (d) Carbon monoxide

23. Aerosols consisting of solid particles produced by combustion is known as:
    (a) Fog   (b) Smog
    (c) Smoke   (d) None of these

24. The full form of COD is:
   (a) Chemical Oxygen Demand
   (b) Chemically Oxygen Demand
   (c) Chemistry Oxygen Demand
   (d) None of the above

25. The biochemical oxygen demand is computed by:
   (a) Dissolved oxygen / Dilution factor
   (b) Dissolved oxygen + Dilution factor
   (c) Dissolved oxygen – Dilution factor
   (d) Dissolved oxygen * Dilution factor

26. The horizontal angle between true meridian and a line is called:
   (a) Magnetic meridian
   (b) Azimuth
   (c) Arbitrary meridian
   (d) Magnetic declination

27. Levelling in which the change in atmospheric pressure is recorded:
   (a) Barometric levelling
   (b) Profile levelling
   (c) Trigonometrically levelling
   (d) Reciprocal levelling

28. In traverse surveying the directions of survey lines are fixed by:
   (a) Forming a network of triangles
   (b) Angular measurements
   (c) Running of check lines
   (d) Arranging equilateral triangles

29. Total error in latitude and departure is distributed in proportion to the lengths of the sides by:
   (a) Transit rule
   (b) Reversal point rule
   (c) Centesimal rule
   (d) Bowditch rule

30. Which instrument in designed to work based on the satellite?
   (a) EDM
   (b) GYRO
   (c) GPS
   (d) Laser Scanner

31. What will be the angle between the two lines AB and AC whose bearings are 56° and 154° respectively?
   (a) 98°
   (b) 82°
   (c) 210°
   (d) 18°

32. The maximum permissible angular error in seconds in a closed underground traverse of 16 stations measured with 20 seconds theodolite is:
   (a) 200
   (b) 120
   (c) 80
   (d) 160

33. The combined effect of curvature and refraction in levelling is an error which is:
   (a) Additive
   (b) Subtractive
   (c) Multiplicative
   (d) Divisive

34. Error in length due to incorrect chain can be corrected by formula......where, L'= incorrect length of chain, L= True length of chain
   (a) (L x measured length)/L'
   (b) (L' x measured length)/L
   (c) (L' x L)/measured length
   (d) Measured length/(L' x L)

35. The algebraic sum of the deflection angles of a closed n- sided traverse is equal to:
   (a) 2n + 4right angles
   (b) 2n – 4right angles
   (c) 360°
   (d) 2n right angles

36. The C-factor for a mapping system is determined by:
   (a) Camera, aircraft, photo lab equipment, and stereo plotting equipment.
   (b) Ground control, flying height, camera, and photo lab equipment.
   (c) Flying height, weather, relief displacement, and camera.
   (d) Stereo plotter operator, camera, ground control, and airplane altitude.

37. Dip of the magnetic needle will be zero at:
    (a) North pole
    (b) South pole
    (c) Equator
    (d) None of the above

38. In the base line measurement of triangulation survey the correction for sag is:
    (a) Always Positive
    (b) Always negative
    (c) Cumulative
    (d) None of the above

39. To mark the river, lake tank, pond etc., on mine plane so as to take precautions against inundation the survey to be done by-
    (a) Traversing
    (b) Correlation
    (c) Levelling
    (d) Triangulation

40. The permissible error for correlation by wires in two shafts is:
    (a) ± 18 of arc
    (b) ± 28 of Arc
    (c) ± 58 of Arc
    (d) None of the above

41. The stadia diaphragm is provided for measuring:
    (a) Elevation
    (b) Bearing
    (c) Horizontal distance
    (d) None of the above

42. The tangential method of tachometry is generally used when the diaphragm having-
    (a) 2 additional horizontal hairs
    (b) 2 additional hairs
    (c) No stadia hairs
    (d) None of the above

43. When the line of sight inclined and the staff is held vertically, the horizontal distance is given by:
    (a) $(f/i) \times s \cos^2 u + (f+d) \cos u$
    (b) $(f/i) \times s \sin^2 u + (f+d) \sin u$
    (c) $(f/i) \times s \cot^2 u + (f+d) \cot u$
    (d) None of the above

44. Degree of accuracy in primary triangulation is:
    (a) 1 in 500000
    (b) 1 in 50000
    (c) 1 in 100000
    (d) 1 in 250000

45. Errors that follow some physical law and can be predicted is called
    (a) Random error
    (b) Systematic error
    (c) Mistake
    (d) Proportional error

46. Rope type used for haulage transport in underground mine is:
    (a) Lang's lay type
    (b) Ordinary lay type
    (c) Full locked coil type
    (d) Half locked coil rope

47. Which of the following clutch is preferably used with direct rope haulage?
    (a) Dog clutch
    (b) Friction clutch
    (c) Centrifugal clutch
    (d) All of the above

48. In which of the locomotive there is maximum possibility of formation of CO with exhaust gas?
    (a) Diesel loco
    (b) Battery loco
    (c) Trolley wire loco
    (d) Compressed air loco

49. The minimum gradient for direct rope haulage is:
    (a) 1 in 10
    (b) 1 in 11
    (c) 1 in 12
    (d) 1 in 14

50. Angle of fleet should not be more than:
    (a) $1.5°$
    (b) $1.6°$
    (c) $1.7°$
    (d) $1.8°$

51. Speed control method used for large winders:
    (a) OCB filter
    (b) Ward Leonard method
    (c) ABC filter
    (d) Rheostatic control method

52. If the r. m. s torque for a winder is 109 kNm, the cylindrical winding drum diameter is 4.4 m and the maximum rope speed is 7 m/s. What will be the minimum power requirement to run the motor?
    (a) 347 kW
    (b) 388 kW
    (c) 243 kW
    (d) 375 kW

53. The main function of the Keps in the winding system is:
    (a) To ensure proper alignment of the cage floor and decking level
    (b) To prevent the cage from over winding
    (c) To control the speed of cage
    (d) None of the above

54. The alternate name of koepe winder is:
    (a) Drum winder
    (b) Multirope winder
    (c) Friction winder
    (d) Bi-cylindro winder

55. Detaching safety hooks are used only in:
    (a) Drum winders
    (b) Koepe winders
    (c) Both drum and koepe winders
    (d) None of the above

56. In which of the following locomotive exhaust conditioner is provided?
    (a) Trolley wire locomotive
    (b) Diesel locomotive
    (c) Compressed air locomotive
    (d) Battery locomotive

57. If the track gauge of underground haulage is 0.6 m, radius of curve 2 m, velocity of train is 2 m/sec. What will be the amount of super elevation?
    (a) 0.02
    (b) 0.12
    (c) 0.22
    (d) 0.32

58. Which coating is done with the belt surface to make it fire resistant?
    (a) Nylon
    (b) Rubber
    (c) Bentonite
    (d) PVC

59. The maximum angle of inclination for conveying coal by P.V.C conveyor belt is
    (a) $17°$
    (b) $16°$
    (c) $18°$
    (d) $20°$

60. The approximate head generated by a single stage centrifugal pump of 250 mm diameter impeller running at 1440 r. p.m. with monomeric efficiency of 0.7 is?
    (a) 25 m
    (b) 29 m
    (c) 80 m
    (d) 144 m

61. Volute casing in the pump_____.
    (a) Has gradual increasing cross section
    (b) Has gradual decreasing cross section
    (c) Has uniform cross section
    (d) Has randomly increasing cross section

62. For dewatering in case of sudden inundation, the type of pump used is:
    (a) Face pump
    (b) Turbine pump
    (c) Submersible pump
    (d) Vertical drill pump

63. Balancing disc is provided in:
    (a) Turbine pump
    (b) Centrifugal pump
    (c) In both turbine and centrifugal pump
    (d) None of the above

64. In the volute casing of the pump the velocity of air gradually decreases but pressure energy increases correspondingly. This happens due to?

    (a) Pythagoras theorem   (b) Charles's law

    (c) Hook's law   (d) Bernoulli's theorem

65. As per governing laws of the pump, the relationship between water quantity (Q) and rotation of impeller (rpm) is:

    (a) Q = rpm   (b) Q a rpm

    (c) Q > rpm   (d) Q a 1/rpm

66. Trough shape of the belt conveyor is made with the help of :

    (a) Bottom roller   (b) Idlers

    (c) Drive roller   (d) Snub pulley

67. The maximum gradient for the endless haulage is:

    (a) 1 in 3   (b) 1 in 4

    (c) 1 in 5   (d) 1 in 6

68. A conveyor transported the coal at the rate of 220 te/hr is 600 m long moving up a gradient of 1 in 60. If the belt width (W) is 0.75 and cross sectional area of the material is $0.1 \, W^2$ along with bulk density of coal is $0.8 \, t/m^3$. Calculate the belt speed.

    (a) 0.04 m/s   (b) 0.96 m/s

    (c) 1.36 m/s   (d) 1.89 m/s

69. Which of the following pump is used as main at the pit bottom sump?

    (a) Submersible pump   (b) Face pump

    (c) Multi stage turbine pump   (d) Reciprocating pump

70. Method of joining two wire rope permanently known as:

    (a) Rope splicing   (b) Rope capping

    (c) Rope linking   (d) Rope plugging

71. Oxygen balance in Ammonium Nitrate Fuel Oil (ANFO) mixed explosive is achieved when:

    (a) 95.3% AN and 4.7% FO by weight   (b) 94.3% AN and 5.7% FO by weight

    (c) 90.0% AN and 10.0% FO by weight   (d) 95.0% AN and 5.0% FO by weight

72. In emulsion explosive, one of the chemical/ingredient is not included. What is that chemical/ingredient?

    (a) Ammonium nitrate   (b) Water

    (c) Emulsifying agent   (d) Nitroclycerine

73. Heavy ANFO is a mixture/blend of ANFO explosive with:

    (a) Emulsion explosive   (b) Aluminum Powder

    (c) Lead Powder   (d) Iron Powder

74. The full form of RDX is:

    (a) Reduced Diameter Explosive   (b) Royal Demolition Explosive

    (c) Research Department Explosive   (d) Both (b) & (c)

75. Permitted explosive is used for:

    (a) Blasting in sensitive area   (b) Blasting in underground coal mines

    (c) Blasting in restricted area   (d) All of the above

76. In the classification of explosives, the "Category - Z" means:

    (a) Explosive having a mass explosion risk and major missile effect

    (b) Explosive having high VOD, but low gas energy

    (c) Explosive having sympathetic detonation with high gap sensitivity

    (d) Low explosives having velocity of detonation less than 2000 m/s

77. Based on Schedule-1, "Nitro-Compound" comes under the explosive classification of:
    (a) Class-1   (b) Class-2
    (c) Class-3   (d) Class-4

78. According to rock breakage mechanism by blasting the first impact is produced by:
    (a) Gas energy   (b) Shock wave linked to strain energy
    (c) Heat energy   (d) Borehole pressure

79. In conventional bench blasting a large part of the strain wave energy is transferred into:
    (a) Seismic Energy which causes ground vibration   (b) Gas energy
    (c) Noise /Air over pressure   (d) None of the above

80. In the calculation and design of blasting, the controllable parameters are classified as:
    (a) Geometric (Diameter, charge length. burden, spacing, etc.)
    (b) Physicochemical or pertaining to explosives
    (c) Delay timing and initiation sequence
    (d) All of the above

81. Stiffness ratio is the ratio of ?
    (a) Bench height to burden   (b) Bench height to spacing
    (c) Burden to bench height   (d) Hole depth to sub-drill length

82. Which of the following is not a geometric controllable parameter of blasting ?
    (a) Burden   (b) Spacing
    (c) Type of explosive   (d) Hole depth

83. In bench blasting, if burden = 4.0 m, Spacing = 5.0 m & Hole depth = 10 m. If the designed specific charge/powder factor is 0.65 kg/m^3, what should be the value of explosive charge per hole?
    (a) 120 kg   (b) 130 kg
    (c) 140 kg   (d) 160 kg

84. Which one is the technique of controlled blasting?
    (a) Staggered bench blasting   (b) Cast blasting
    (c) Pre-splitting   (d) None of the above

85. In bench blasting, if 'D' is the diameter of hole, then burden value generally varies from:
    (a) 10D to 20D   (b) 15D to 25D
    (c) 25D to 40D   (d) 40D to 50 D

86. In which type of rock mass you can expect to obtain high powder factor in terms of m^3/kg.
    (a) Heavily jointed rock mass   (b) Hard and massive rock mass
    (c) Rock with high compressive strength   (d) All of the above

87. The major advantage of delay timing detonators in blasting are:
    (a) Improved fragmentation
    (b) Reduction of ground vibration, air-blast, flyrock and over-break
    (c) Improved productivity and lower cost
    (d) All of the above

88. The speed of the shock wave within Nonel tube which initiate the blasting cap/detonator at the bottom is about:
    (a) 1000 m/s   (b) 2000 m/s
    (c) 5000 m/s   (d) 7000 m/s

89. Which drilling pattern is generally used in bench blasting?
- (a) V-cut pattern
- (b) Fan-cut pattern
- (c) Burn-cut pattern
- (d) Staggered pattern

90. Which of the explosive initiation system does not used pyrotechnic delay materials?
- (a) Electric detonator
- (b) Nonel/shock tube system
- (c) Electronic detonator
- (d) Copper tube detonator

91. For solid blasting in underground coal mines, the delay period between the first and the last shot in Degree-III gassiness should not exceed:
- (a) 100 milliseconds
- (b) 150 milliseconds
- (c) 200 milliseconds
- (d) 300 milliseconds

92. The permissible explosive charge per shot hole for solid blasting in Degree-I gassiness underground coal mines is:
- (a) 1.500 kg
- (b) 0.565 kg
- (c) 1.00 kg
- (d) 1.250 kg

93. Which one is not the adverse effect of blasting?
- (a) Flyrock
- (b) Ground vibration
- (c) Air overpressure
- (d) Rock fragmentation

94. As per the DGMS technical circular 7 of 1997 concerning to blast vibration standard in mm/s, what are the frequency range for different vibration levels:
- (a) < 8 Hz; $8 - 25$ Hz; > 25 Hz
- (b) < 10 Hz; $10 - 20$ Hz; > 20 Hz
- (c) < 5 Hz; $5 - 15$ Hz; > 55 Hz
- (d) < 15 Hz; $15 - 20$ Hz; > 50 Hz

95. As per the DGMS technical circular 7 of 1997 concerning to blast vibration standard in mm/s, the maximum vibration level recommended for objects of historical importance and sensitive structures not belonging to the owner is:
- (a) 2 mm/s
- (b) 5 mm/s
- (c) 10 mm/s
- (d) 25 mm/s

96. The detonation pressure associated with the reaction zone of detonating explosives is directly proportional to the square of its:
- (a) Velocity of detonation
- (b) Heat generated
- (c) Density of explosive
- (d) All of the above

97. Uniform Velocity of detonation (VOD) is essentially required throughout the blast holes in the rock formations in order to produce sufficient _____ to the borehole walls.
- (a) Detonation pressure
- (b) Vibration force
- (c) Air overpressure
- (d) None of the above

98. The size of rock fragments obtained from blasting is not affected by:
- (a) Rock strength
- (b) Explosive strength
- (c) Rock joint patterns
- (d) Tensile strength of detonating cord

99. Which one is not a system of mechanism rock drilling?
- (a) Rotary drilling
- (b) Plasma drilling
- (c) Percussion drilling
- (d) Rotary – percussion drilling

100. The standard diameter of NX size core is:
- (a) 38 mm diameter
- (b) 50 mm diameter
- (c) 54 mm diameter
- (d) 60 mm diameter

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