MIZORAM PUBLIC SERVICE COMMISSION

TECHNICAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO THE POST OF JUNIOR ENGINEER UNDER AGRICULTURE DEPARTMENT (CROP HUSBANDRY), GOVERNMENT OF MIZORAM. MARCH-2020

TECHNICAL PAPER - I

Time Allowed : 2 hours Full Marks : 150

Attempt all questions.

All questions carry equal marks of two (2) each

1. Irrigation may be defined as the process of artificially supplying water to soil for
(a) Wetting land (b) flooding land
(c) Moisturing land (d) Raising crops

2. Fertigation is a process in _____ irrigation.
(a) Sprinkler (b) Drip
(c) Surface (d) Well

3. A system of rotational water allocation system which can fulfil the requirement of equality is call
(a) Shejpali system (b) Block system
(c) Warabandi system (d) Localised system

4. Roughness coefficient (h) of the channel lining for concrete in Manning's formula is-
(a) 0.014 – 0.016 (b) 0.017 – 0.030
(c) 0.030 – 0.033 (d) 0.040 – 0.044

5. If cross-sectional area of channel is 2.0sqm, wetted perimeter is 3m and has a velocity of 0.20 m/sec, the carrying capacity Q will be –
(a) Q = 0.40 m^3/sec (b) Q = 4.00 m^3/sec
(c) Q = 0.10 m^3/sec (d) Q = 10.00 m^3/sec

6. The maximum permissible velocity in Boulder lining for irrigation channel as per Indian Standards is
(a) 1.0 m/sec (b) 1.5 m/sec
(c) 2.0 m/sec (d) 2.5 m/sec

7. What is the minimum value of free-board for Main and Branch Lined canals if the discharge is more than 10 cumecs as per specified by BIS code
(a) 0.75 (b) 0.65
(c) 0.55 (d) 0.45

8. Advantage of lined channel is-
(a) Decreases seepage losses (b) Increase in channel capacity
(c) Provide safety against breaks (d) All of these

9. In lined channels, stability against _____ is generally not a consideration unless abrasive material is being carried in a high velocity flow.
(a) Flood (b) Seepage losses
(c) Erosion (d) Earthquake

10. Pipes and drains act as open channels when flowing-

(a) Partially full
(b) Full capacity
(c) Both (a) & (b)
(d) None of these

11. By Chezy's formula, Velocity of flow (v) in a channel is

(a) $v = C\sqrt{RS}$ where C is constant, R is wetted perimeter and S is hydraulic slope

(b) $v = C\sqrt{RS}$ where C is constant, R is hydraulic radius and S is slope percentage

(c) $v = C\sqrt{RS}$ where C is constant, R is hydraulic radius and S is hydraulic slope

(d) $v = C\sqrt{RS}$ where C is constant, R is roughness coefficient and S is hydraulic slope

12. Calculate the mean hydraulic radius for a channel having 30 m^2 cross sectional area, 2 m/sec is the velocity and 60 m of wetted perimeter.

(a) 30 m
(b) 0.5 m
(c) 15.0 m
(d) 0.06 m

13. Velocity of flow in a channels varies _____ with the square root of the hydraulic slope.

(a) Inversely
(b) Directly
(c) Indirectly
(d) None of these

14. Total amount of water used by the plant in _____ from adjacent soils or from plant leaves, in any specified time is called Consumptive use (C_u).

(a) Transpiration and evaporation
(b) Hydration and evaporation
(c) Transpiration and percolation
(d) Precipitation and evaporation

15. The vertical distance between the highest water level anticipated in channel design and the top of the retaining banks is called-

(a) Full supply level of water
(b) Maximum permissible water level
(c) Maximum water wave level
(d) Free board

16. To prevent erosion in field channels, structure like_____ are provided.

(a) Open drop, pipe drops & chute drops structure
(b) Rectangular & trapezoidal gate structure
(c) Dykes & retaining wall structure
(d) Barrage & diversion weir structure

17. A good water control structures are necessary for

(a) Reduce labor for irrigation, reduce debris & water loss in the channel.
(b) Distributing irrigation, check velocity of water & water loss in the field.
(c) Reduceing labor for irrigation, check erosion & water loss in the field.
(d) Abolish labor for irrigation, check scouring & water loss in the field.

18. The permissible value of mean velocity of flow in an earthen channel in loamy soil is

(a) 40 cm / sec
(b) 60 cm / sec
(c) 80 cm / sec
(d) 100 cm / sec

19. The prismoidal formula used for computing the volume of earthwork in land levelling is _____, where V=vol.of earthwork (m^3), L=Perpendicular distance between end planes (m), A_1=Area of first end plane(m^2), A_2=Area of the second end plane (m^2) and A_m=Area of middle section parallel to end planes (m^2).

(a) $V = \frac{L}{4}(A_1 + 2A_m - A_2)$ (b) $V = \frac{L}{6}(A_1 + 2A_m - A_2)$

(c) $V = \frac{L}{4}(A_1 + 2A_m + A_2)$ (d) $V = \frac{L}{6}(A_1 + 4A_m + A_2)$

20. The most commonly adopted land levelling design in small scale jobs is

(a) Contour adjustment method (b) Profile method

(c) Plan inspection method (d) Simple plane method

21. For Medium (loamy) soils recommended safe limits of land slop for efficient irrigation is-

(a) 0.05 to 0.20 (longitudinal slope, %) (b) 0.20 to 0.40 (longitudinal slope, %)

(c) 0.40 to 0.65 (longitudinal slope, %) (d) 0.60 to 0.80 (longitudinal slope, %)

22. Contour lines, either close together or far apart may imply that-

(a) The average natural slope is either too steep or too flat.

(b) The average natural slope is either too rocky or too steep.

(c) The average natural slope is either too flat or below sea level.

(d) The average natural slope is either too clayey or too sandy.

23. Water is measured under two conditions

(a) At turbulence (hydraulic jump) and in motion (canals, rivers etc.)

(b) At rest (reservoir, ponds etc.) and in motion (canals, rivers etc.)

(c) At rest (reservoir, ponds etc.) and in volume (canals, rivers etc.)

(d) At upstream and in downstream

24. One (1) hectare-meter is equal to

(a) 100,000 liters (b) 1 million liters

(c) 10 million liters (d) 100 million liters

25. If a 38 liter capacity bucket is filled in 12 second by the discharge from a channel and the depth of channel is 0.6m, then the rate of flow is

(a) 0.32 liter per second (b) 20.0 liter per second

(c) 22.8 liter per second (d) 3.17 liter per second

26. By what structures the regulator can control the supplies entering the off take channel?

(a) Sluice gates (b) Falls

(c) Dams (d) Piers and planks

27. The minimum slope usually allowed for soft clay and alluvial soils for cutting and fillings is _____ and _____ respectively.

(a) 1 : 1, $1\frac{1}{2}$: 1 to 2 : 1 (b) 2 : 1, 2 : 1

(c) 1 : 1, 3 : 1 (d) 1 : 1, 1.0 : 1 to 3 : 1

28. According to _____, the amount of silt held in suspension is proportional to the upward force of vertical eddies, and varies as the bed width and some power of the velocity of flow in the channel.

(a) Lacey's theory (b) Chezy's formula

(c) Kennedy's theory (d) Manning's formula

29. The drawbacks in Lacey's theory is

(a) The concentration of silt is not included as variable.

(b) Lacey did not properly define the silt grade and silt charge.

(c) Both (a) & (b)

(d) None of these

30. Irrigation water source generated in households or office buildings from streams without fecal contamination is call

(a) Surface water (b) Ground water

(c) Industrial waste water (d) Grey water

31. If 2.50 cumecs of water supply is required for a crop sown in an area of 2500 ha. and the base period is 120 days, the duty of irrigation water will be

(a) 1000 ha / cumec (b) 20.83 ha / cumec

(c) 6250 ha / cumec (d) 48.00 ha / cumec

32. _____ is the total depth of water required by a crop during the entire period the crop is in the field.

(a) Duty (D) (b) Delta (D)

(c) Crop period (d) Base period (B)

33. In a metric system, if B is base period in days and D is duty in ha/cumec, then total depth of water supplied (D) will be-

(a) $\Delta = \frac{Bx24x60x60}{Dx10000}$ (b) $\Delta = \frac{Bx24x60x60}{Dx1000}$

(c) $\Delta = \frac{Dx24x60x60}{Bx10000}$ (d) $\Delta = \frac{Bx24x60}{Dx10000}$

34. Which method is widely used in India for the computation of consumptive use?

(a) Penman's equation (b) Tanks and lysimeter

(c) Hargreaves – Christiansen equation (d) Blaney – Criddle equation

35. Culturable Command Area (CCA) consist of –

(a) Gross Command Area + Unculturable Area.

(b) Gross Command Area – Unculturable Area.

(c) Culturable Cultivated Area + Unculturable Area.

(d) Culturable Cultivated Area – Unculturable Area.

36. Duty of water of canal system depends upon –

(a) Canal condition & Type of crop. (b) Methods and systems of irrigation.

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

37. Quantity of water flowing for one day at the rate of 1 cumec is known as a _____ and is equal to _____ hectare-meters.

(a) Cumec-day, 8.64 (b) Cusec-day, 8.64

(c) Cumec-day, 8.46 (d) Cusec-day, 8.46

38. Factor affecting consumptive use of water by a crop are –

(a) Evaporation, cropping pattern & precipitation. (b) Transpiration, water source & canal.

(c) Wind velocity, water quality & lined channel. (d) Irrigation depth, topography & forestation.

39. _____ may be defined as the quantity of water, regardless of its source, required by a crop or diversified pattern of crops in a given period of time for its normal growth under field conditions at a place.

(a) Total water demand
(b) Water requirement of crops
(c) Net irrigation requirement
(d) Total irrigation supply

40. What is the correct formula for Gross Irrigation requirement?

(a) C_u - R_e
(b) CIR + leaching losses
(c) FIR/N_c
(d) NIR/N_a

41. Field Irrigation Requirement $(FIR) = \frac{NIR}{n}$

(a) where n is Water application efficiency & NIR is net irrigation req.
(b) where n is Water application requirement & NIR is net irrigation req.
(c) where n is Water conveyance efficiency & NIR is net irrigation req.
(d) where n is Water conveyance requirement & NIR is net irrigation req.

42. The intensity of irrigation means –

(a) Percentage of gross command area to be irrigated annually
(b) % of the mean CCA and GCA to be irrigated annually
(c) Total amount of water supplied in one time
(d) % of culturable command area to be irrigated annually

43. Duty of water helps in the work out of _____ for designing the channel.

(a) Discharge required
(b) Total depth of water
(c) Velocity of water
(d) Source of water

44. A particular irrigation field has CCA of 100 hectares, out of which 100 hectares of land is cultivated for kharif season and 50 hectares of land is cultivated for rabi season. What is the intensity of irrigation for each season?

(a) 50%, 100%
(b) 50%, 50%
(c) 100%, 100%
(d) 100%, 50%

45. 1 acre = _____ hectare

(a) 0.4047
(b) 0.4011
(c) 0.3801
(d) 0.2500

46. The science which deals with the occurrence, distribution and movement of water on the earth, including that in the atmosphere and below the surface of the earth is called

(a) Environment cycle
(b) Hydrology
(c) Climatology
(d) Water resources cycle

47. What source of energy does evaporation and precipitation consist of?

(a) Kinetic energy
(b) Thermal energy
(c) Seasonal energy
(d) Perennial energy

48. Average annual rainfall ranging to dessert to hilly region would be __

(a) 1100 cm
(b) 2500 cm
(c) 820 cm
(d) 500 cm

49. In non-recording rain gauges (standard gauges) if the collector area is 200 sq.cm and the bottle capacity is 4 litres, then the nominal capacity of rain gauge in cm of rainfall will be

(a) 20 (b) 50

(c) 80 (d) 100

50. Intensity of rainfall is measured by

(a) Anemometer (b) Continuously recording gauge

(c) Hydrometer (d) Seismometer

51. A map which connects points that have the same amounts of precipitation in a given period or for a particular storm is call

(a) Rainfall contour map (b) Isobars map

(c) Isohyetal map (d) Isotherms map

52. Excess rainfall or effective rainfall is

(a) Rainfall – Initial basin loss – Infiltration

(b) Rainfall – Initial basin loss + Infiltration

(c) Rainfall – Interception – Infiltration

(d) Rainfall – Interception + Infiltration

53. A hydrograph of stream-flow is a graphical representation of the discharge flowing in a river at a given location and is plot between

(a) Rate of Flow (on X – axis) and discharge (on Y-axis)

(b) Time (on X – axis) and discharge (on Y-axis)

(c) Runoff (on X – axis) and discharge (on Y-axis)

(d) Rainfall (on X – axis) and discharge (on Y-axis)

54. Runoff consists of

(a) Surface runoff (b) Base flow

(c) Direct precipitation over the river stream (d) All of these

55. Which geometric parameter determines the efficiency of the channel?

(a) Hydraulic depth (b) Section depth

(c) Hydraulic radius (d) Norma depth

56. If a rain starts at 10:20 A.M., and the entire basin area just starts contributing water to the outlet at 11:00 A.M., depth of rainfall is 5.5 cm, then the time of concentration (T_c) will be

(a) $T_c = 30$ minutes (b) $T_c = 40$ minutes

(c) $T_c = 50$ minutes (d) $T_c = 60$ minutes

57. If Q_p is peak rate of runoff in cumecs, K=Coefficient of runoff, A= Drainage area of the basin in Ha., p_c= mean rainfall intensity in cm/hr for a duration equal to T_c and a given frequency of occurrence, then Peak Rate of Runoff can be computed by rational formula

(a) $Q_p = \left[\frac{1}{36}\right] K\, p_c\, A$ (b) $Q_p = \left[\frac{1}{24}\right] K\, p_c\, A$

(c) $Q_p = \left[\frac{1}{12}\right] K\, p_c\, A$ (d) $Q_p = \left[\frac{1}{60}\right] K\, p_c\, A$

58. The process of water entering the surface strata of the soil and moves towards the water table and becomes ground water is called

(a) Saturation (b) Infiltration

(c) Sedimentation (d) Decantation

59. Soil moisture content which is retained indefinitely by the soil grain by molecular attraction against the gravity is called

(a) Saturation zone (b) Ground water

(c) Field capacity (d) Aquifer

60. I21solated water table held by a small extension of impervious rock is called

(a) Underlying water (b) Secret water

(c) Under water (d) Perched water

61. The best known classification system in textural classification is

(a) MIT classification system

(b) International classification

(c) Indian classification system

(d) Triangular classification of US public road administration

62. According to USCS, the fined grained soil is classified on the basis of

(a) Grain size (b) Plasticity

(c) Group index (d) Shape

63. Based on the degree of distinctness of peds (natural aggregates of soil particles), grades of soils are

(a) Structureless, hard, moderate and strong

(b) Weak, moderate and strong

(c) Structureless, weak, moderate and strong

(d) Structureless, weak, and fragile

64. _____ is usually defined as the arrangement and stage of aggregation of soil particle in soil mass.

(a) Soil structure (b) Soil Particle size classification

(c) Soil aggregation classification (d) Soil formation

65. If the net ultimate bearing capacity (q_{nf})is 291.75 kN/m^2 and safety factor is 3, the Net safe bearing capacity (q_{ns}) will be

(a) 98.25 kN/m^2 (b) 97.15 kN/m^2

(c) 0.010 kN/m^2 (d) 97.25 kN/m^2

66. In case of general shear failure, continuous failure surfaces developed between the

(a) Edge of the footing and ground surface (b) Center of footing and Ground surface

(c) Foundation and the underground surface (d) None of these

67. If a soil sample has a porosity (n) of 40% and the specific gravity of solids is 2.70, the void ration(e) will be give by

(a) $e = \dfrac{n}{1-2.7}$ (b) $e = \dfrac{2.70}{1-n}$

(c) $e = \dfrac{n}{1-n}$ (d) $e = \dfrac{n}{2.70-n}$

68. For Agriculture farm operations, power is needed to operate machineries for

(a) Water pumping for irrigation
(b) Seed bed preparation
(c) Intercultural operation
(d) All of these

69. The average command area of a power tiller (7.46 kw) is _____, where one pair of bullock can command about _____ only.

(a) 4 hectares, 2 hectares
(b) 3 hectares, 1 hectare
(c) 5 hectares, 2 hectares
(d) 7 hectares, 1 hectare

70. The operations performed to open up any cultivable land with a view to prepare a seed bed for growing crops, are termed as

(a) Puddling
(b) Primary tillage
(c) Secondary tillage
(d) Combine tillage

71. During suction stroke of Diesel engine and Carburetor Engine, only _____ and _____ is taken in respectively.

(a) Air alone, mixture of air and fuel
(b) Mixture of air and fuel, air alone
(c) Fuel, air
(d) Air alone, Fuel alone

72. In diesel cycle engine heat is added at

(a) Constant temperature
(b) Constant volume
(c) Constant pressure
(d) None of these

73. In petrol engine and diesel engine, fuel is ignited by _____ respectively.

(a) The heat of compressed air and Electric spark
(b) Electric spark and the heat of compressed air
(c) Both by the heat of compressed air
(d) Both by Electric spark

74. Mechanical efficiency (η_{mech}) is expressed as

(a) $\eta_{mech} = \frac{b_p}{i_p}$ where b_p is break horse power and i_p is indicated horse power

(b) $\eta_{mech} = \frac{b_p}{i_p}$ where b_p is break horse power and i_p is injected horse power

(c) $\eta_{mech} = \frac{b_p}{i_p} \times 100$ where b_p is break horse power and i_p is indicated horse power

(d) $\eta_{mech} = \frac{b_p}{i_p} \times 100$ where b_p is effective horse power and i_p is injected horse power

75. Horse Power transmitted by a flat belt (for 3 ply belts) can be approximately estimated as

(a) $HP = \frac{\text{speed in metre per minute} \times \text{width in m.}}{800}$

(b) $HP = \frac{\text{revolution in metre per hour} \times \text{width in m.}}{800}$

(c) $HP = \frac{\text{rotation in metre per second} \times \text{width in m.}}{800}$

(d) $HP = \frac{\text{velocity in metre per minute} \times \text{width in cm.}}{800}$