

MIZORAM PUBLIC SERVICE COMMISSION

GENERAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO THE POST OF JUNIOR ENGINEER UNDER IRRIGATION & WATER RESOURCES DEPARTMENT OCTOBER, 2018

AGRICULTURE ENGINEERING PAPER-I

Time Allowed : 2 hours

Full Marks : 150

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

1. High speed engines operates at the following speeds
 - (a) Less than 1000 rpm
 - (b) At 500 rpm
 - (c) Higher than 1000 rpm
 - (d) None of these
2. Normally in irrigation channels silting may take place in the channel if the slope is less than
 - (a) 0.025%
 - (b) 0.05%
 - (c) 0.0025%
 - (d) 0.005%
3. A unit hydrograph has
 - (a) One unit of peak discharge
 - (b) One unit of time base of direct run-off
 - (c) One unit of direct run-off
 - (d) One unit of rainfall duration
4. For estimation of peak rate of flood for design purpose of structure in absence of any data, the value of ϕ -index is taken as
 - (a) 0.2cm/hr
 - (b) 0.3cm/hr
 - (c) 0.1cm/hr
 - (d) 0.4cm/hr
5. Most commonly used non-recording type rain-gauge is
 - (a) Weighting bucket
 - (b) Symon's rain-gauge
 - (c) Tipping bucket rain-gauge
 - (d) Floating type rain-gauge
6. Straight line method for base flow separation is given as
 - (a) $N=0.89A^{0.2}$, days
 - (b) $N=0.88A^{0.2}$, days
 - (c) $N=0.88A^{0.4}$, days
 - (d) $N=0.89A^{0.4}$, days
7. The first irrigation before sowing of the crop is known as
 - (a) Kor watering
 - (b) Cumec Day
 - (c) Nominal Duty
 - (d) Paleo
8. Symon's rain-gauge has a receiving bottle capacity of about
 - (a) 75-150 mm of rainfall
 - (b) 70-100 mm of rainfall
 - (c) 70-150 mm of rainfall
 - (d) 75-100 mm of rainfall
9. The discharge through orifice is calculated by the formula
 - (a) $Q=0.61 \times 10^{-3} a \sqrt{2gH}$
 - (b) $Q=0.61 \times 10^3 a \sqrt{2gH}$
 - (c) $Q=0.61 \times 10^{-3} \sqrt{2gH}$
 - (d) $Q=0.61 \times 10^3 \sqrt{2gH}$
10. Gross Command Area (GCA) can be define as
 - (a) CCA + Culturable area
 - (b) CCA + Culturable and Unculturable area
 - (c) CCA + Unculturable area
 - (d) CCA + Culturable Uncultivable area

11. The arrangement of primary & secondary soil particles is called as
 - (a) Soil structure
 - (b) Soil texture
 - (c) Soil consistency
 - (d) Soil plasticity
12. Peak of a flood hydrograph due to 4-hr effective storm is $400\text{m}^3/\text{s}$. The mean depth of the rainfall is 5.9 cm. Assuming an average infiltration loss of 0.35cm/hr and a constant base flow of $25\text{m}^3/\text{s}$, estimate the peak of a 4-hr unit hydrograph.
 - (a) $80.23\text{m}^3/\text{s}$
 - (b) $83.33\text{m}^3/\text{s}$
 - (c) $93.23\text{m}^3/\text{s}$
 - (d) $90.33\text{m}^3/\text{s}$
13. The compression ratio of petrol engine is
 - (a) 16:1
 - (b) 1:15
 - (c) 50:1
 - (d) 8:1
14. Water that exists in the pore space of the soil by molecular attraction is
 - (a) Capillary water
 - (b) Hygroscopic water
 - (c) Available water
 - (d) Both (a) & (c)
15. The use of governor on engine is to:
 - (a) Increase the speed
 - (b) Decrease the speed
 - (c) Maintain the speed almost constant
 - (d) Increase & Decrease the speed
16. In Lacey's Regime Theory the perimeter discharge (P Q) relation can be written as
 - (a) $P=0.75\sqrt{Q}$
 - (b) $P=3.75\sqrt{Q}$
 - (c) $P=2.75\sqrt{Q}$
 - (d) $P=4.75\sqrt{Q}$
17. For a metric system if B is the Base period. Delta, a total depth of water supply (Δ) in meters is inversely proportional to Duty (D) in hectares/cumec as
 - (a) $8.62 B/D$ meters
 - (b) $8.26 B/D$ meters
 - (c) $8.64 B/D$ meters
 - (d) $8.46 B/D$ meters
18. The ultimate wilting point or the hygroscopic coefficient is about
 - (a) $1/3$ of the permanent wilting point
 - (b) $3/2$ of the permanent wilting point
 - (c) $2/3$ of the permanent wilting point
 - (d) $3/5$ of the permanent wilting point
19. Irrigation capacity of a unit water is represented by
 - (a) Duty
 - (b) Nominal Duty
 - (c) Delta
 - (d) Both (a) & (b)
20. The whole period of cultivation from the time when irrigation water is first issued for preparation of the ground for planting the crop to its last watering before harvest refers to
 - (a) Crop period
 - (b) Base period
 - (c) Yield Duty
 - (d) Kor period
21. In a system of canal higher critical velocity ratio (CVR) is assumed in
 - (a) Towards its tail end
 - (b) In head reaches
 - (c) Towards its head reaches
 - (d) Both (a) & (b)
22. Kirpich formula estimates the time of concentration (T_c) as
 - (a) $T_c = 0.02((L^3 / H)^{1/2})^{0.77}$
 - (b) $T_c = 0.02L^{0.77} S^{-0.385}$
 - (c) $T_c = 0.02(LS)^{-0.385}$
 - (d) $T_c = 0.02(LS)^{0.77}$

23. Capacity factor is the ratio of
(a) Mean supply to the full supply of a canal (b) Mean discharge to the full supply of water
(c) Mean discharge to the average canal supply (d) Both (a) & (b)
24. Most common type of self recording gauge is
(a) Weighing bucket (b) Symon's rain-gauge
(c) Tipping bucket type (d) Float type automatic raingauge
25. The Cipoletti weir, a contracted trapezoidal weir the side of the notch has a slope of
(a) 1:4 (b) 1:2
(c) 1:3 (d) 1:1
26. A crop requires a total depth of 9.2cm of water for a base period of 120 days. Then the duty of water is
(a) 1130ha/m³ (b) 1140ha/m³
(c) 1150ha/m³ (d) 1120ha/m³
27. Discharge measurement for small and medium size streams are commonly done by
(a) 90° V- notch weir (b) Rectangular weir
(c) Cipoletti weir (d) Both (a) & (b)
28. Bucket capacity of tipping rain gauge is
(a) 2.5cm of rainfall (b) 0.25mm of rainfall
(c) 12.7mm of rainfall (d) 5.0mm of rainfall
29. A loam soil has field capacity of 22% and wilting coefficient of 10%. The dry unit weight of soil is 15g/cm³. If the root zone depth is 70cm, determine the storage capacity of the soil. Irrigation water is applied when moisture content falls to 14%, if the water application efficiency is 75%, determine the water depth required to be applied in the field (Field irrigation req.)
(a) Storage capacity=14.6cm, Field irrigation Req.=12.2cm
(b) Storage capacity=11.6cm, Field irrigation Req.=10.2cm
(c) Storage capacity=12.6cm, Field irrigation Req.=11.2cm
(d) Storage capacity=13.6cm, Field irrigation Req.=14.2cm
30. In Kennedy's Theory the critical velocity (V), m/s may be written as
(a) $V = 0.55m D^{0.64}$ (b) $V = 0.84D^{0.65}$
(c) $V = 0.84m D^{0.64}$ (d) $V = 0.55m D^{0.65}$
31. Find the delta for crop if the Duty for a base period of 110 days is 1400 ha/m³
(a) 0.86m (b) 0.68m
(c) 0.96m (d) 0.98m
32. Average rainfall over a basin may be computed using
(a) Arithmetic average method (b) Thiessen polygon method
(c) Isohyetal method (d) All of these
33. A hydrometric curve is a plot of
(a) Time of concentration and elevation curve of catchment
(b) Area elevation curve
(c) Spot rainfall values and isohyets on a basin map
(d) Depth of rainfall & elevation of a catchment

34. Irrigation canals are generally aligned along
- (a) Ridge line (b) Contour line
(c) Valley line (d) Straight line
35. For a Frictional Slope (S_f) and hydraulic radius (R) in meter Chezy's Roughness co-efficient (C) flow velocity through open channels can be estimated using
- (a) $V = C\sqrt{RS_f}$ (b) $V = 2C\sqrt{RS_f}$
(c) $V = 1/2C\sqrt{RS_f}$ (d) $V = 1/2 R^{2/3} S_f$
36. The size of the fine clay particles in USDA classification of soil texture is
- (a) <2mm (b) <0.2mm
(c) <0.02mm (d) <0.002mm
37. A water course has a culturable command area of 1200ha. The intensity of irrigation for crop A is 40% and for B is 35%, both the crop being Rabi crops. Crop A has a Kor period of 20 days and crop B has Kor period of 15 days. Calculate the discharge of the water course if the depth for crop A is 10cm and for B is 16cm.
- (a) $A=0.278m^3$ & $B=0.518m^3$ (b) $A=0.0278m^3$ & $B=0.0518m^3$
(c) $A=2.78m^3$ & $B=5.18m^3$ (d) $A=0.378m^3$ & $B=0.618m^3$
38. The main components of hydrologic cycle are
- (a) Precipitation, evapotranspiration and evaporation
(b) Rainfall, evaporation and runoff
(c) Rainfall and snow fall
(d) None of these
39. Engine Flywheel is made of
- (a) Cast iron (b) Mild steel
(c) Aluminium alloy (d) Both (b) & (c)
40. Which of the term is used for implement/ tools efficiency
- (a) Field capacity (b) Hp
(c) Cut off (d) Power
41. Factor (m), critical velocity ratio (CVR) of Kennedy's Theory value of sandy loamy silt is
- (a) 1.10 (b) 1.20
(c) 1.30 (d) 1.00
42. Portable wooden boxes provided with a gate at the inlet and a baffle board at the outlet is called
- (a) Diversions (b) Portable box dams
(c) Portable box checks (d) Box turn outs
43. Wind energy is measured in terms of
- (a) Watts (b) Watts/hr
(c) Watts/m (d) Watts/m²
44. The sheet factor of water which overflows a weir is called
- (a) Head (b) Nappe
(c) Static head (d) All of these
45. The hydraulic radius of lined canal water course rectangular in section with a bottom width of 50 cm and depth of flow of 25 cm is
- (a) 0.125 m (b) 0.126 m
(c) 0.128 m (d) 0.127 m

46. The opening and closing of engine valve system is controlled by
(a) Camshaft through push rod (b) Crankshaft through flywheel
(c) Camshaft through piston rods (d) Engine valve through push rod
47. Which of the following tool is use for collecting uprooted weeds
(a) Hand Cultivators (b) Khurpa
(c) Garden Rake (d) Garden Trowel
48. Discharge through a 90° V- notch weir may be computed by using the equation
(a) $Q=0.0138 H^{5/2}$ (b) $Q=0.0138 H^{3/2}$
(c) $Q=0.0138 H^{2/5}$ (d) $Q=1.0138 H^{2/3}$
49. The relative proportion of soil particles is called as
(a) Soil structure (b) Soil texture
(c) Soil consistency (d) Soil plasticity
50. Calculate the bottom width of a trapezoidal channel having best hydraulic section to carry a design discharge at a flow depth of 2m side slope for the channel may be taken as 1:1
(a) 1.657 m (b) 1.576 m
(c) 1.765 m (d) 1.675 m
51. The peak of a flood hydrograph due to a 6-hr storm is $470\text{m}^3/\text{s}$. The mean depth of rainfall is 8.0cm. Assuming an average infiltration loss of $0.25\text{cm}/\text{hr}$ and a constant base flow of $15\text{m}^3/\text{s}$, estimate the peak discharge of 6-hr Unit hydrograph for this catchment.
(a) $65\text{m}^3/\text{s}$ (b) $70\text{m}^3/\text{s}$
(c) $80\text{m}^3/\text{s}$ (d) $75\text{m}^3/\text{s}$
52. Shearing resistance consists of following components
(a) Cohesion and adhesion (b) Consolidation
(c) Compaction (d) Infinite slope
53. Which type of canal is not under canal classification on the basis of the function of the canal
(a) Irrigation canal (b) Watershed canal
(c) Power canal (d) Navigation canal
54. In channel design the value for rugosity coefficient, N for earthen channel for good channel condition is
(a) 0.03 (b) 0.025
(c) 0.0257 (d) 0.0275
55. Commonly used methods for computation of consumptive use of water is
(a) Penman method (b) Blaney Criddle method
(c) Hargreaves Class method (d) All of these
56. According to Lacey's Regime Equations velocity may be obtained as
(a) $V=10.8R^{1/3} S^{2/3}$ (b) $V=10.8 R^{2/3} S^{2/3}$
(c) $V=10.8 R^{2/3} S^{1/3}$ (d) $V =10.8 R^{2/3} S^{1/2}$
57. Wheat crop requires 45 cm of irrigation under water during 120 days irrigation period. How much land can be irrigated with a flow of 20 liters per second for 22 hrs a day.
(a) 42.24 ha (b) 40.24 ha
(c) 45.0 ha (d) 41.24 ha

58. The load in which the sediment moves along the bed with occasional jumps into the channel is called
- (a) Suspended load (b) Bed load
(c) Sediment load (d) Both (a) & (b)
59. Power tiller is best suited for
- (a) Water lifting (b) Ploughing
(c) Haulage (d) Puddling
60. The basic formula for calculating discharge through a weir is
- (a) $Q=CLH^m$ (b) $Q=CLH^n$
(c) $Q=CHL^m$ (d) $Q=CLH$
61. Witting coefficient of sandy loam soil is
- (a) 6 (b) 13
(c) 15 (d) 4
62. Direct measurement of consumptive use of water may be done using
- (a) Field experiment plot (b) Integrated method
(c) Interaction method (d) Both (a) & (b)
63. Soil that have 60% clay, 20% sand and 20% silt can be grouped into the textural class of
- (a) Clay (b) Silt clay
(c) Silt (d) Silty clay loam
64. A Cipoletti weir has a breadth of 60 cm at its crest. The head of water flowing over the crest is 30 cm. Determine its discharge
- (a) 183 lts/s (b) 180 lts/s
(c) 160 lts/s (d) 163 lts/s
65. Manning's 'n' value for lined channels for concrete type is
- (a) 0.0015 (b) 0.15
(c) 0.015 (d) 0.05
66. A abrupt curve in the canal result in
- (a) Silting on inside (b) Scouring
(c) Silting occurring both (d) Silting on sides
67. The ratio of the no. of days the canal has actually run to the base period in days is
- (a) Capacity factor (b) Area to be irrigated
(c) Time factor (d) None of these
68. The advantages of lining are
- (a) Seepage control (b) Prevention from water logging
(c) Increase in command area (d) All of these
69. Inundation irrigation is sometimes called as
- (a) Flood irrigation (b) Lift irrigation
(c) Flow irrigation (d) Both (a) & (b)
70. Assuming an earth channel on a grade of 0.10%, depth of water 40 cm, bottom width 40 cm and side slope $1^{1/2}$ to 1. Calculate the carrying capacity of the channel.
- (a) 182 lts/s (b) 180 lts/s
(c) 190 lts/s (d) 192 lts/s

71. A rainfall is called as light rainfall when its intensity is
(a) Less than 2.5 mm/hr (b) 2.5 mm/hr
(c) More than 2.4 mm/hr (d) 2.4 mm/hr
72. The firing order of 4-Stroke Engine is
(a) 1-2-4-3 (b) 1-3-4-2
(c) 1-2-3-4 (d) Both (a) & (b)
73. Water flows through a constricted rectangular weir 120 cm long to a depth of 30 cm it then flows along a rectangular channel 150 cm wide and over a second weir which has its length equal to the channel. Determine the depth of water over the second weir.
(a) 25.38 cm (b) 20.38 cm
(c) 35.38 cm (d) 30.38 cm
74. Line on a rainfall map of the basin joining places of equal rainfall reading is called
(a) Isohyets (b) Isoline
(c) Isocontour (d) Isohyetals
75. For in cases of suppressed rectangular weir discharge may be estimated using equation
(a) $Q=0.0184 LH^{2/3}$ (b) $Q=0.184 LH^{3/2}$
(c) $Q=0.0814 LH^{2/3}$ (d) $Q=0.184 HL^{3/2}$

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