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 - II

Time Allowed : 2 hours FM : 200

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

1. Choose the correct answer from the followings in connection with Uniform Flow in an open channels:-

(a) Flow properties such as the depth or discharge at a section do not change with time.

(b) Flow properties such as the depth or discharge remain constant along the length of the channel.

(c) Uniform flow practically, can either be steady or un-steady.

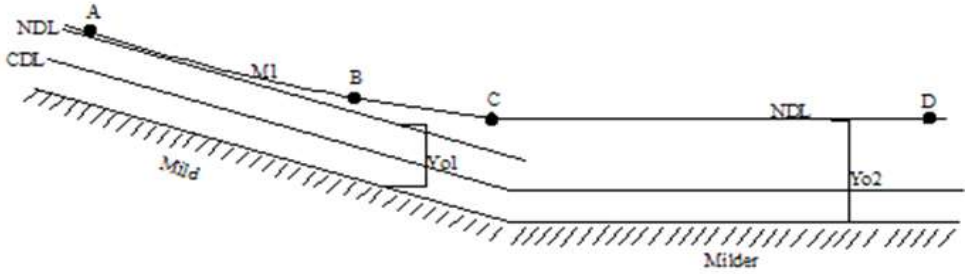
(d) Flow in a given channel geometry with only one degree of freedom will always be uniform flow.

2. The flow in a channel is at critical depth. If at a section B a small hump of height DZ is built on the bed of the channel, the flow will be :-

(a) Critical at B (b) Critical upstream of B

(c) Supercritical at B (d) Supercritical upstream of B

3. The figure shows a Gradually varied Flow (GVF) profile at break in grades. The Normal depth line (NDL) and Critical depth line (CDL) are as shown. The location of Control is :-



(a) at location A (b) at location B

(c) at location C (d) at location D

4. In a hydraulic structure where a supercritical stream meets a subcritical stream of sufficient depth, there will be :-

(a) No change in the energy (b) No flow of stream possible

(c) Magnification of energy (d) Dissipation of energy

5. A fluid flow in an elementary rectangular parallelopipe with side length equal to dx, dy and dz is having velocity component in x,y,z directions u,v and w respectively and the mass density of fluid is r. If the fluid is incompressible, the continuity equation in cartesian coordinate is given by :-

(a) $\partial u/\partial x + \partial v/\partial y + \partial w/\partial z = 0$

(b) $\partial(ru)/\partial x + \partial(rv)/\partial y + \partial(rw)/\partial z = 0$

(c) $\partial r/\partial t + \partial(ru)/\partial x + \partial(rv)/\partial y + \partial(rw)/\partial z = 0$

(d) $\partial r/\partial t + \partial(ru)/\partial x + \partial(rv)/\partial y + \partial(rw)/\partial z - (\partial u/\partial x + \partial v/\partial y + \partial w/\partial z) = 0$

6. In which type of the following flow of fluid, viscosity plays a significant part :-

(a) Turbulent flow (b) Laminar flow

(c) Rotational flow (d) Irrotational flow

7. Choose the correct statement from the followings pertaining to flow of fluid

(a) Velocity potential increases with an increase in velocity in the x.y and z directions

(b) Velocity potential decreases with a decrease in velocity in the x.y and z directions

(c) Flow is always in the direction of increasing velocity potential

(d) Flow is always in the direction of decreasing velocity potential

8. Choose which of the following equation is independent of the system of units (SI,Metric or English system) :-

(a) Manning's equation (b) Chezy's equation

(c) Laminar flow in pipes (d) Kennedy's equation

9. The flow in the boundary layer along a long thin plate, upto a certain portion of the plate from the leading edge, exhibits the characteristics of :-

(a) Turbulent if the incoming stream is turbulent

(b) Laminar flow if the incoming stream is laminar

(c) Turbulent irrespective of whether the incoming stream is laminar or turbulent

(d) Laminar irrespective of whether the incoming stream is laminar or turbulent

10. The frictional resistance in the laminar flow through pipes is independent of :-

(a) Nature of the surface in contact (b) Velocity of flow

(c) Area of surface in contact (d) Temperature of the flowing fluid

11. Slipper bearing in lubrication mechanics is an example of :-

(a) Laminar flow between two fixed plates (b) Couette flow

(c) A curved surface lubricant film (d) Dash-Pot mechanism

12. The velocity distribution for turbulent flow in pipes, using usual notation is given as $v=V_*/\log_e y+c$, where C is the constant. This logarithmic velocity distribution is applicable to :-

(a) Regions close to the boundary of pipes

(b) Throughout the Cross Section of pipes

(c) Flow in the central region of the pipe

(d) Regions close to the boundary of hydrodynamically rough surface

13. The shear stress in a steady laminar flow through circular pipes (Hagen-poiseuille Law) is given as $t = -\partial r/\partial x(r/2)$, the equation indicates :-

(a) Shear stress is zero at the centre of the pipe

(b) Shear stress is maximum at the centre of the pipe

(c) Fluid pressure increases in the direction of flow

(d) Shear stress is constant along the radius of the pipe

14. The actual thermodynamic process which is approximated by the relation pv^n = Constant, where n is a positive constant is called :-

(a) Isothermal process (b) Adiabatic process

(c) Polytropic process (d) Isentropic process

15. In a compressible fluid flow where the velocity of flow is reduced to zero and the kinetic energy is converted into pressure energy is the :-

(a) Mach line (b) Stagnation point

(c) Zone of silence (d) Zone of action

16. In order to accelerate the flow of compressible fluid at super-sonic velocity, the flow passage must :-

(a) remain a uniform cross-section (b) converge

(c) diverge (d) flow passage does not have any effect

17. The conversion of compressible fluid from super-sonic flow to a sub-sonic flow is always accompanied by a sudden :-

(a) increase in velocity (b) decrease in density

(c) increase in pressure (d) increase in both pressure and density

18. In Hardy Cross method of pipe network analysis, the correction to be applied to the assumed flows of the circuit for the pipes common to two circuits or loops will be applied :-

(a) Only for one of the loops (b) for both the loops

(c) not necessary to be applied (d) for the loop with flow in clock-wise direction

19. The water hammer phenomenon in pipes is due to :-

(a) destruction of flow momentum (b) increment of flow momentum

(c) lowering of vapour pressure (d) increment of vapour pressure

20. In Siphon mechanism of flow through pipes, arrangement required to be considered to limit the reduction of pressure at the summit is :-

(a) limiting the length of outlet leg

(b) limiting the length of inlet leg

(c) limiting the water pressure at higher elevation reservoir

(d) limiting the water pressure at lower elevation reservoir

21. The method used for testing the consistency of rainfall record is :-

(a) Hyetograph (b) Mass Curve of rainfall

(c) Thiessen-mean method (d) Double-mass curve

22. For a storm of given duration, which of the following storm will have a larger return period :-

(a) storms of smaller intensity (b) storms of larger intensity

(c) storms of medium intensity (d) cannot be predicted

23. If the allowable degree of error in the estimate of the mean rainfall is 10% and the co-efficient of variation of the rainfall values at the existing stations in percentage is 30, the optimum number of Raingauge stations in the catchment area would be :-

(a) 3 (b) 6

(c) 8 (d) 9

24. Under identical conditions, evaporation will be the least from which of the followings :-

(a) Sea water (b) Fresh river water

(c) Water from ponds (d) Lake water

25. The method of evaporation estimation involving writing the hydrological continuity equation for the lake and determining the evaporation from a knowledge or estimation of other variables is :-

(a) Energy-Budget method
(b) Mass-Transfer method
(c) Water-Budget method
(d) Colorado Sunken pan method

26. If e_w and e_a are the saturated vapour pressures of the water surface and air respectively, the Dalton's law for evaporation E_L in unit time is given by E_L = :-

(a) $(e_w - e_a)$
(b) $Ke_w e_a$
(c) $K(e_w - e_a)$
(d) $K(e_w + e_a)$

27. The storm Hydrograph is basically to examine the :-

(a) long-term runoff
(b) short-term runoff
(c) Hydrological Drought management
(d) Evapo-transpiration

28. Consider the statement, " The Hydrograph is the response of a given catchment to a rainfall input. It consists of flow in all the three phases of runoff, viz, surface runoff, interflow and baseflow and embodies the integrated effects of a wide variety of catchment and rainfall parameters having complex interaction".

Choose the correct statement(s) from the followings :-

(a) identical storms in two catchments produce different hydrographs
(b) identical storm in two catchment produce identical hydrographs
(c) two different storms in a given catchment produce identical hydrographs
(d) both (b) & (c) are correct

29. For an annual flood series arranged in decreasing order of magnitude, the return period for a magnitude listed at position m in a total of N entries is :-

(a) m/N
(b) m/(N+1)
(c) (N+1)/m
(d) N/(m+1)

30. A linear reservoir is one in which :-

(a) the volume varies linearly with elevation
(b) the storage varies linearly with the outflow rate
(c) the storage varies linearly with time
(d) the storage varies linearly with the inflow rate

31. The Muskingum method of flood routing is a :-

(a) form of reservoir routing method
(b) hydraulic routing method
(c) complete numerical solution of St Venant equations
(d) hydrologic channel routing method

32. The probable maximum flood is :-

(a) an extremely large but physically possible flood in the region
(b) the standard project flood of an extremely large river
(c) a flood adopted in the design of all kinds of spillways
(d) a flood adopted in all hydraulic structures

33. A sandy clay unit in the earth formation is an example of :-

(a) Aquifuge
(b) Aquiclude
(c) Aquitard
(d) Aquifer

34. If the pressure surface of Aquifer lies above the ground surface, the well will be :-

(a) Artesian well
(b) Non-artesian well
(c) Non-flowing artesian well
(d) Flowing artesian well

35. For one dimensional flow without recharge in an unconfined aquifer between two water bodies, the steady water table profile is :-

(a) an ellipse
(b) a parabola
(c) a straight line
(d) an arc of a circle

36. Specific capacity in connection with Ground water is :-

(a) a constant for a given well
(b) depends on aquifer characteristics only
(c) increases with discharge rate
(d) decreases with time from the start of pumping

37. A reservoir primarily used to store the excess water during the period of large supplies and release it gradually as and when it is needed is :-

(a) Storage reservoir
(b) Flood control reservoir
(c) Distribution reservoir
(d) Multipurpose reservoir

38. For a given inflow rate in a reservoir :-

(a) trap efficiency increases with the reduction in reservoir capacity
(b) trap efficiency decreases with the increase in reservoir capacity
(c) trap efficiency decreases with the reduction in reservoir capacity
(d) there is no correlation between trap efficiency and reservoir capacity

39. The useful life of reservoir ended when capacity is reduced to :-

(a) 10% of the design capacity
(b) 20% of the design capacity
(c) 25% of the design capacity
(d) 30% of the design capacity

40. If in a flow-mass curve, a demand line drawn tangent to the lowest in a valley of the curve does not intersect the mass curve at an earlier time period, it represents that :-

(a) the reservoir is full at the beginning of the dry period
(b) the reservoir is wasting water by spill
(c) the storage is inadequate
(d) the reservoir will not be full at the start of the dry period

41. The available hydraulic power possess by a particular stream / river can be assessed in kilowatt-hours (kwh) using the relation, where η is the efficiency of hydro power station and others are in usual notations :-

(a) $E = 9.81Q(H-h_f)\eta$
(b) $E = Q(H-h_f)\eta$
(c) $E = 9.81Q(H-h_f)\eta \times T$
(d) $E = Q(H-h_f)\eta \times T$

42. The table shows extract of computation for daily flow duration curve of typical river for a particular year,

Flow Rate (Cumec)	Number of days	Days equalled or exceeded	Percentage of time
28.00	9	303	X
30.00	13	?	Y

Fill-up the Days equalled or exceeded for the flow rate of 30.00 :-

(a) 21 (b) 4

(c) 321 (d) 294

43. If river flow permits, the hydro-power plant that can operate both as peak-load and base-load plant is :-

(a) Run-of-river plant with pondage (b) Pumped storage plant

(c) Reservoir plant (d) Tidal plants

44. The Capacity factor of hydro-power plant will be identical with the load factor when :-

(a) Peak load is less than plant capacity (b) Peak load equals to plant capacity

(c) Peak load is less than utilization factor (d) Peak load equals to utilization factor

45. Which of the followings is not an accessories of an intake structure of Hydro-power plant :-

(a) Rakes (b) Penstock closing gates with hoist

(c) Forebay (d) Trash rack

46. Choose the correct answer from the following for Reaction type hydraulic turbines :-

(a) The water action on the wheel vanes is under pressure greater than atmospheric

(b) The wheel passages are not completely filled with water

(c) The water is supplied at a few points at the periphery of the wheel

(d) Energy applied to the wheel is wholly kinetic energy

47. Pelton wheel turbine is an example of :-

(a) Mix flow turbine (b) Axial flow turbine

(c) Radial flow turbine (d) Tangential flow turbine

48. If the working head available in hydro-power plant is less than 30 m, which of the following turbine would be suitable for the project :-

(a) Pelton wheel (b) Turgo-impule wheel

(c) Kaplan turbine (d) Modern Francis turbine

49. Which of the following factor(s) will influence the selection of type of turbine in Hydel project:-

(a) Water Quantity required (b) The variability of load

(c) The rotational speed of turbine (d) All of these

50. In hydro-electric power plant, a passage of gradually increasing cross-sectional area connecting the runner exit to the tail race is :-

(a) Scroll casing (b) Governor

(c) Draft-tube (d) Runs and platforms

51. The speed of the Generator in hydro-power plant can be maintained constant only if the speed of the turbine is constant, equal to the one given by the relation (where p is the number of pair of poles for the Generator and f is the frequency for power generated in cycles per second) :-

(a) 60f/p (b) 70/p

(c) 60/p½ (d) 70/p½

52. The specific speed of turbines having the same efficiency is affected by :-

(a) Sizes of the actual turbine & specific turbine

(b) Certain critical dimensions of actual turbine & specific turbine

(c) Geometrical shape of actual turbine & specific turbine

(d) Both (a) & (b)

53. The name D.Thoma of Germany in connection with hydraulic turbine is associated with :-

(a) Performance curves (b) Efficiency

(c) Specific turbine (d) Cavitation

54. For the sake of convenience, the characteristic curves of hydraulic turbines are plotted in terms of :-

(a) Theoretical quantities (b) Actual tests quantities

(c) Unit quantities (d) Statistical data quantities

55. Choose the correct answer from the following :-

(a) Turbine with highest permissible specific speed is not preferable

(b) Higher specific speed turbine is generally more liable to cavitations

(c) Turbine with higher specific speed will be relatively bigger in size

(d) Higher the specific speed of turbine, higher will be the relative costs

56. In calculating NPSH values of hydraulic pump, pressure to be considered is :-

(a) Minimum anticipated barometric pressure

(b) Maximum anticipated vapour pressure

(c) Maximum anticipated pressure of both barometric and vapour pressure

(d) Minimum anticipated barometric pressure and maximum anticipated vapour pressure

57. If the water power required of a pump is 16 kw and the efficiency of the pump is 80%, the pump input power will be :-

(a) 12.8 kw (b) 20 kw

(c) 20.8 kw (d) 30 kw

58. In one complete revolution of the crank in double acting pump, there will be :-

(a) One suction and one delivery stroke

(b) Two suction strokes and one delivery stroke

(c) Two suction strokes and two delivery strokes

(d) One suction stroke and two delivery strokes

59. Air vessel in reciprocation pump is provided to :-

(a) have continuous uniform rate supply of liquid from a single acting pump

(b) have a uniform rate of liquid in delivery stroke for a single acting pump

(c) have both (a) & (b)

(d) prevent possible air lock during operation of the pump

60. Hydraulic Ram works on the principle of :-

(a) Pascal's Law
(b) Water hammer
(c) Energy utilization of liquid at low pressure
(d) Centrifugal pump action

61. The presence of excess sodium in water for irrigation purpose affect the soil's :-

(a) Permeability
(b) Electrical conductivity
(c) Acidity concentration
(d) Both (a) & (c)

62. As the water flows in irrigation operation, the Duty of water :-

(a) remain same
(b) decreases
(c) increases
(d) either decreases or increases

63. Which of the following irrigation efficiency takes into account the transit losses :-

(a) Water use efficiency
(b) Water surface efficiency
(c) Water distribution efficiency
(d) Water conveyance efficiency

64. The detention type of Dam among the followings is :-

(a) Spillway
(b) Dike
(c) Weir
(d) Barrage

65. According to Indian standard recommendation, the uplift pressure in a Gravity dam is assumed to act over :-

(a) 100 % of the area
(b) 75% of the area
(c) At toe plus 1/3rd the difference of hydrostatic pressure at heel and toe
(d) At heel plus 1/3rd the difference of hydrostatic pressure at heel and toe

66. A gallery in a Gravity dam is :-

(a) a platform as part of the working platform during operation
(b) an arrangement at convenient locations to check visually the water level of dam
(c) An opening left in the Dam running either transversely or longitudinally
(d) a platform for sightseeing by the public

67. Priming and Depriming in spillway is associted with :-

(a) Trough spillway
(b) Tunnel spillway
(c) Shaft spillway
(d) Siphon spillway

68. A special type of spillway designed in India by Ganesh Iyer is :-

(a) Volute siphon spillway
(b) Saddle siphon spillway
(c) Conduit spillway
(d) Chute spillway

69. The difference between a storage weir and a dam is only in :-

(a) height
(b) duration for storage of supply
(c) both (a) & (b)
(d) there is no difference

70. Choose the wrong statement from the following in connection with Bligh's creep theory :-

(a) the outer edges of faces of end sheet piles are much more effective than the inner ones
(b) There is no explanation about the requirements of exit gradient
(c) The theory holds good as long as the horizontal distance between the pile lines is greater than twice their depths
(d) There is no distinction between horizontal and vertical creep

71. A small channel which ultimately feeds the water to irrigation field is :-

(a) Branch canal (b) Water course

(c) Minors distributary (d) Major distributary

72. The minimum radius of curve recommended in irrigation channel of capacity 3 to 15 cumecs is :-

(a) 100 m (b) 159 m

(c) 300 m (d) 600 m

73. According to Kennedy's theory the quantity of silt transported is given by $Q_t = aBV^{5/2}$ where a is the constant, the value of a as determined by Kennedy is :-

(a) 0.5 to 0.4 (b) 0.9 to 0.8

(c) 1.1 to 1.2 (d) Not determined by Kennedy

74. The idea of Shock losses in silting phenomenon of channel was introduced by :-

(a) Lacey (b) Kennedy

(c) Lindley (d) Meyer Peter

75. Garret's diagram for graphical method of designing channel dimensions is based on :-

(a) Lacey's theory (b) Kennedy's theory

(c) Einstein's equation of probability law (d) Stage discharge curve

76. Choose the wrong statement from the following in connection with waterlogging in irrigation engineering-

(a) Drainage becomes impossible and CO_2 cannot be dissolved

(b) The roots of the plants are confined to the top layers soil above the water-Table

(c) Soil remains warm thus bacterial action becomes sluggish

(d) There is accumulation of alkali salts in the surface soil

77. In an area where the danger of waterlogging has become imminent :-

(a) Further canal irrigation should be introduced

(b) No further canal irrigation should be introduced

(c) The area should be irrigated by Tube wells

(d) Both (b) & (c) are recommended

78. The canal outlet in which the discharge is affected by fluctuation in water level of distributing channel but not affected by water level fluctuation of the field channel is :-

(a) Non-modular outlet (b) Flexible outlet

(c) Rigid module (d) Both (b) & (c)

79. In a canal regulation works when a distributing channel takes off from the parent channel, the best alignment of an off-take when it makes an angle with the parent channel of :-

(a) Zero angle (b) Acute angle

(c) Obtuse angle (d) Right angle

80. The Groyne in River Engineering which is constructed in such a way that it points downstream the direction of normal flow is :-

(a) Repelling Groyne (b) Neutral Groyne

(c) Deflecting Groyne (d) Attracting Groyne

81. The Ozone depleting potential of Dichlorotetrafluoroethane ($C_2F_4Cl_2$) is :-

(a) 0.6 (b) 0.8

(c) 1.0 (d) 10.0

82. Sulfurous smog is caused almost entirely by :-

(a) Motor vehicles (b) Power plants

(c) Municipal waste (d) Combination of (a) & (c)

83. The type of plastic generally used for indoor fire sprinkler system since it is suited for use with both hot water and pressurized water is :-

(a) PVC Pipe (b) UPVC Pipe

(c) CPVC Pipe (d) PE Pipe

84. The growth of a community with limited land area for future expansion might be modelled using the :-

(a) Declining growth model (b) Geometric model

(c) Uniform percentage growth model (d) Arithmetic constant growth rate model

85. Choose the odd one out from the following water works system :-

(a) Pipe lines (b) Aqueducts

(c) Open Channels (d) Tunnels

86. The phenomenon in Cast-iron pipe when it becomes numerous and large that interference with the water flow and loss of pressure, making expensive cleaning operations necessary is :-

(a) Corrosion (b) Tuberculation

(c) Cavitation (d) Water hammering

87. Protection against corrosion to water pipes by deposition or adsorbtion of ions on metallic surface is

(a) Galvanic protection (b) Metallic coating

(c) Cathodic protection (d) Inhibition

88. Fire hydrants are classified as one-way, two-way, three-way and four-way depending upon :-

(a) The number of hose outlets provided

(b) The number of hose inlets provided

(c) The type of valve of the gate

(d) The diameter of the hydrant

89. Which of the following is viral type of waterborne disease :-

(a) Salmonellosis (b) Giardiasis

(c) Poliomyelitis (d) Shigellosis

90. The water contamination that may be concentrated by Algae or other water organism and upon eaten by fishes can get further concentration is :-

(a) Lead (b) Radioactive isotopes

(c) Fluoride (d) Mercury

91. The most common cause of acidity in water is :-

(a) CO_2 (b) CO

(c) NO_3 (d) H

92. Typhoid out break can happen due to infected milk and other foods, particularly oysters, salads and other uncooked food, the epidemic could be waterborne when :-

(a) it is scattered over the city

(b) dysentery accompany or precede typhoid

(c) All classes and ages of people are affected

(d) All of these

93. Water treatment method which had been used occasionally alone but usually not incorporated in the modern treatment works anymore is :-

(a) Aeration
(b) Chemical coagulation
(c) Plain sedimentation
(d) Distillation

94. In the principle of plain sedimentation, discrete particles having settling velocity lower than SOR are

(a) entirely removed
(b) partially get removed
(c) remain in suspension
(d) removed in direct proportion to the ratio of their settling velocity and vertical velocity

95. In sedimentation tanks if the horizontal velocity is just sufficient to produce scour then :-

(a) the particles will be carried to the outlet before settling
(b) the particles will be resuspended
(c) scouring will happen at the bottom of the tank
(d) the flow pattern will minimize the effect of inlet and outlet disturbances

96. In water treatment operation, a slow mixing process in which destabilized colloidal particles are brought into intimate contact in order to promote their agglomeration is :-

(a) Mixing
(b) Coagulation
(c) Flocculation
(d) Stabilization

97. A part of sewer system that receives the discharge from the collecting system and conducts it to the treatment plant or point of final disposal is :-

(a) Sewer outfall
(b) Relief sewer
(c) Lateral sewer
(d) Intercepting sewer

98. The minimum velocity in sewers to be maintained in order to prevent settlement of sewage solid in the system is :-

(a) 0.4 m/s
(b) 0.6 m/s
(c) 0.8 m/s
(d) 0.9 m/s

99. At what temperature that sewage will change from fresh to stale in 2 to 6 hours :-

(a) about $15^{o}C$
(b) about $18^{o}C$
(c) about $20^{o}C$
(d) about $22^{o}C$

100. The simplest multi-cellular micro-organism that require a relatively high dissolved oxygen and that their presence is a good indication of relative stability of a treated waste is:-

(a) Rotifers
(b) Algae
(c) fungi
(d) Protozoa

* * * * * * *