

MIZORAM PUBLIC SERVICE COMMISSION

TECHNICAL COMPETITIVE EXAMINATIONS FOR JUNIOR GRADE OF MIZORAM ENGINEERING SERVICE (M.E.S.) UNDER PUBLIC HEALTH DEPARTMENT, GOVERNMENT OF MIZORAM, MARCH, 2019.

CIVIL ENGINEERING PAPER - II

Time Allowed : 3 hours

FM : 200

SECTION - A (Multiple Choice questions)

(100 Marks)

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

This Section should be answered only on the OMR Response Sheet provided.

- When a body is placed over a liquid, it will sink down if
 - Gravitational force is equal to the up-thrust of the liquid
 - Gravitational force is less than the up-thrust of the liquid
 - Gravitational force is more than the up-thrust of the liquid
 - None of these
- The pressure of the liquid flowing through the divergent portion of venturimeter:
 - Remains constant
 - Decreases
 - Increases
 - Depends on mass of liquid
- The ratio of the inertial force to the _____ is call Euler's number.
 - Pressure force
 - Elastic force
 - Surface tension force
 - Viscous force
- The Bernoulli equation $\frac{P}{W} + \frac{V^2}{2g} + Z = \text{constant}$ is based on the following assumptions regarding the fluid flow:
 - Steady, frictionless, uniform and along a streamline
 - Steady, frictionless, incompressible and along a streamline
 - Steady, frictionless, incompressible and uniform
 - All of these
- Coefficient of velocity is defined as the ratio of
 - Actual velocity of jet at vena contracta to the theoretical velocity
 - Area of jet at vena contracta to the area of orifice
 - Actual discharge through orifice to the theoretical discharge
 - None of these
- A fluid in equilibrium can't sustain
 - Tensile stress
 - Compressive stress
 - Shear stress
 - Bending stress

7. Rain drops are spherical because of
 - (a) Surface tension force
 - (b) Viscosity
 - (c) Air resistance
 - (d) None of these
8. Newtons law of viscosity is a relationship between
 - (a) Pressure, velocity and temperature
 - (b) Shear stress and rate of shear strain
 - (c) Shear stress and velocity
 - (d) Rate of shear strain and temperature
9. The flow in a pipe is neither laminar nor turbulent when Reynold number is
 - (a) Less than 2000
 - (b) Between 2000 to 4000
 - (c) Above 4000
 - (d) None of these
10. When a tube of smaller diameter is dipped in water, the water rises in the tube upward ____ surface
 - (a) Concave
 - (b) Convex
 - (c) Plane
 - (d) None of these
11. The major loss of energy in pipes flow is due to
 - (a) Sudden enlargement
 - (b) Sudden contraction
 - (c) Gradual contraction or enlargement
 - (d) friction between pipes and the fluid
12. The ratio of the inertial force to the elastic force is called
 - (a) Reynolds number
 - (b) Froude number
 - (c) Weber number
 - (d) Mach number
13. All the terms of energy in Bernoulli's equation have dimension of
 - (a) Energy
 - (b) Work
 - (c) Mass
 - (d) Length
14. A structure used to dam up a stream or river over which the water flows is call
 - (a) Orifice
 - (b) Weir
 - (c) Notch
 - (d) Dam
15. The most efficient section of channel is
 - (a) Triangular
 - (b) Rectangular
 - (c) Trapezoidal
 - (d) Square
16. The flow mass curve is a graphical representation of
 - (a) Cumulative discharge and time
 - (b) Discharge percentage probability of flow being equalled or exceeded
 - (c) Discharge and time in chronological order
 - (d) Cumulative discharge, volume and time in chronological order
17. For determining the velocity of flow of underground water, the most commonly used non-empirical formula is
 - (a) Lacy's formula
 - (b) Slichter's formula
 - (c) Hazen formula
 - (d) Darcy's formula
18. Main purpose of water training for rivers is,
 - (a) Flood control
 - (b) To provide sufficient depth of water in navigation channel, during low flow
 - (c) To preserve the channel in good shape by efficient disposal of suspended and bed sediments
 - (d) All of these

19. The time required by rain water to reach the outlet of drainage basin, is generally called
- (a) Time of overland flow
 - (b) Time of concentration
 - (c) Time base of direct runoff
 - (d) Concentration time of overland flow
20. A hyetograph is a graphical representation of
- (a) Rainfall intensity and time
 - (b) Rainfall depth and time
 - (c) Discharge and time
 - (d) Cumulative rainfall and time
21. The uplift pressure on the face of a drainage in a dam is taken as
- (a) Hydrostatic pressure at toe
 - (b) $2/3$ of hydrostatic pressure at toe plus $1/3$ of hydrostatic pressure at heel
 - (c) Average of hydrostatic pressure at toe and heel
 - (d) None of these
22. The radius of influence is
- (a) Radius of the main well.
 - (b) Distance from the wall of main well to the point of zero drawdown.
 - (c) Distance from the centre of main well to the point of zero drawdown.
 - (d) None of these.
23. The surface runoff is affected by
- (a) Area of the basin
 - (b) Elevation of the watershed
 - (c) Shape of the basin
 - (d) All of these
24. The aqueduct or super passage type of works are generally used when
- (a) High flood drainage discharge is small
 - (b) High flood drainage discharge is large and short lived
 - (c) High flood drainage discharge is large and continues for a long time
 - (d) None of these
25. The stream which does not have any base flow contribution is called
- (a) Perennial stream
 - (b) Intermittent stream
 - (c) Ephemeral stream
 - (d) None of these
26. In pressure supply mains, water hammer is reduced by providing
- (a) Sluice valves
 - (b) Air valves
 - (c) Pressure relief valves
 - (d) None of these
27. Turbidity of river water flowing through a mountains is a measure of
- (a) Total dissolved solids
 - (b) Suspended solid
 - (c) Colloidal particles
 - (d) mud
28. If the pipe used for laying water supply lines is smaller than the economical diameter:
- (a) Cost of pipe will be less
 - (b) Head loss will be high
 - (c) Cost of pumping will be more than saving
 - (d) All of these
29. Perched aquifers are generally found
- (a) On the surface of the ground
 - (b) Below water table
 - (c) Below the surface of the ground but above water table
 - (d) All of these

30. Most commonly used coagulant is:
- (a) Chlorine (b) Bleaching powder
(c) Alum (d) Lime
31. Methemoglobinemia or blue baby syndrome disease is caused due to
- (a) Nitrates (b) Nitrite
(c) Chloride (d) Sulfate
32. Bio-chemical oxygen demand (BOD) of safe drinking water must be (mg/l)
- (a) 0.05 (b) 0
(c) 0.5 (d) 1.00
33. Alkalinity is expressed as mg/l in terms of equivalent
- (a) Calcium carbonate (b) Magnesium carbonate
(c) Sodium carbonate (d) Calcium hydroxide
34. Bacteria require free oxygen for their survival are called
- (a) Facultative bacteria (b) Pathogenic bacteria
(c) Anaerobic bacteria (d) Aerobic bacteria
35. The velocity recommended to prevent settling down of sewage at bottom or on the sides of large sewer is:
- (a) 0.5 m/s (b) 0.75 m/s
(c) 1 m/s (d) 1.25 m/s
36. Air binding in rapid sand filter is caused due to excessive
- (a) Turbidity (b) Positive pressure
(c) Negative pressure (d) Microbes
37. Removal of oil and grease from sewage, is known
- (a) Screening (b) Skimming
(c) Filtration (d) None of these
38. The uniformity coefficient (UC) i.e. D_{60}/D_{10} for the best filter media sand should be
- (a) 2 (b) 3
(c) 4 (d) 5
39. Air valves are generally provided in pressure pipes of water supply
- (a) At pipe junction (b) At summit
(c) At low point (d) Near service pipes
40. According to Kennedy, the critical velocity (V_o) in meters in a channel is the mean velocity which keeps the channel free from silting and scouring. Its value is given by
- (a) $V_o = 0.84 m D^{0.64}$ (b) $V_o = 0.55 m D^{0.64}$
(c) $V_o = 0.84 m D^{0.54}$ (d) $V_o = 0.55 m D^{0.54}$
- Where, m is the critical velocity ratio and D is the depth of the channel.
41. The efficiency of sedimentation tank does not depend upon
- (a) Depth of tank (b) Length of tank
(c) Detention period (d) velocity of water
42. The duration of contact of chlorine with water before it is distributed to the public should be at least
- (a) 10 to 15 minutes (b) 15 to 20 minutes
(c) 20 to 30 minutes (d) 30 to 40 minutes

43. Lacey's equation for calculating flood discharge in rivers is
- (a) $V=10.8R^{1/2}S^{1/2}$ (b) $V=10.8R^{2/3}S^{1/2}$
(c) $V=10.8R^{2/3}S^{1/3}$ (d) $V=10.8R^{1/3}S^{2/3}$
44. Regime conditions in a channel may occur if
- (a) Discharge is constant
(b) Channel flows uniformly in incoherent alluvium as transported in suspension
(c) Silt grade and silt charge are constant
(d) All of these
45. Irrigation canals are generally aligned along
- (a) Contour line (b) Ridge line
(c) Valley line (d) Straight line
46. Bligh's theory of seepage assumes
- (a) Equal weightage to the horizontal and vertical creep
(b) More weightage to horizontal creep than vertical creep
(c) Less weightage to horizontal creep than vertical creep
(d) Loss of head follows sine curve
47. A Pelton wheel is
- (a) Tangential flow impulse turbine (b) Inward flow impulse turbine
(c) Outward flow impulse turbine (d) Inward flow reaction turbine
48. An impulse turbine is used for
- (a) Low head of water (b) High head of water
(c) Medium head of water (d) High discharge
49. Discharge in centrifugal pump is
- (a) Directly proportional to diameter of its impellar
(b) Inversely proportional to diameter of its impellar
(c) Directly proportion to $(dia)^2$ of its impellar
(d) Inversely proportional to $(dia)^2$ of its impellar
50. Which of the following pump is suitable for small discharge and high heads?
- (a) Centrifugal pump (b) Axial flow pump
(c) Mixed flow pump (d) Reciprocating pump

SECTION - B (Short answer type question)
(100 Marks)

All questions carry equal marks of 5 each.

This Section should be answered only on the Answer Sheet provided.

1. Define cavitation phenomenon. Explain how it can destroy pumps and pipelines.
2. Determine the total pressure force acting on the inclined plane surface and the location of the centre of pressure for a rectangular plate 0.6 m width and 1.2 m deep lies within the water body. The plane is inclined at 45° to the horizontal and the top of the edge is 1 m below the water surface.
3. Briefly explain at least three types of dimensionless flow parameters.
4. Discuss the necessity of surge tank in hydro power plant.
5. Explain any one of the commonly used rainfall runoff equation.
6. Define Positive displacement pumps. Under which conditions this type of pump is used.
7. Lists out various types of reservoir losses.
8. Explain brief procedure and uses of recuperation test.
9. With a neat diagram draw a chlorine disinfection processes. What is the main purpose of residual chlorine?
10. A water treatment plant is to be designed with river water as a sources which flows through mountainous terrain with low organic, high sediments and high dissolved oxygen. Draw conceptual layout of the treatment plant.
11. Why recirculation of sludge is performed in activated sludge processes.
12. What are the key requirements of intake structures for drinking water supply?
13. Describe attached growth systems in wastewater treatment systems with examples.
14. Briefly explain any three commonly used methods of water distribution layout.
15. Describe the principle of hydraulic ram.
16. Define duty, delta and base period of a crop and express the relationship connecting them.
17. Explain the purpose of providing groynes in river training work.
18. What are the various purposes of providing draft tube in reaction turbines?
19. Define specific speed of a turbines.
20. What is soil salinity. How it can be controlled.

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