

MIZORAM PUBLIC SERVICE COMMISSION
TECHNICAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO
ASSISTANT ENGINEERING (CIVIL) CONTRACT BASIS
UNDER TRADE AND COMMERCE DEPARTMENT, JULY 2016.

CIVIL ENGINEERING
PAPER - II

Time Allowed : 3 hours

Full Marks : 200

PART - A

(Objective Type Questions (100 Marks))

All questions carry equal marks of 2 each.

Attempt all questions.

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

1. The property of a fluid which determines its resistance to shearing stresses is called
 - (a) viscosity
 - (b) surface tension
 - (c) compressibility
 - (d) cohesion
2. The type of flow in which the velocity at any given time does not change with respect to space is called
 - (a) steady flow
 - (b) uniform flow
 - (c) rotational flow
 - (d) compressible flow
3. Energy equation is usually applicable to
 - (a) steady flow
 - (b) non-uniform flow
 - (c) laminar flow
 - (d) turbulent flow
4. Equation of continuity of flow is based on the principle of conservation of
 - (a) mass
 - (b) energy
 - (c) force
 - (d) momentum
5. A pitot tube is used for measuring
 - (a) pressure of flow
 - (b) velocity of flow
 - (c) flow rate
 - (d) total energy
6. The piezometric head is the sum of
 - (a) velocity head and pressure head
 - (b) pressure head and elevation head
 - (c) velocity head and elevation head
 - (d) none of these
7. The vertical distance between the total energy line and the hydraulic gradient line is
 - (a) the pressure head
 - (b) the piezometric head
 - (c) the velocity head
 - (d) none of these

8. In case of laminar flow, the loss of pressure head is proportional to
 - (a) velocity
 - (b) velocity²
 - (c) velocity³
 - (d) velocity⁴
9. The maximum velocity in a circular pipe when flow is laminar occurs at
 - (a) the top of the pipe
 - (b) the bottom of the pipe
 - (c) the centre of the pipe
 - (d) none of these
10. The shear in turbulent flow is mainly due to
 - (a) heat transfer
 - (b) mass transfer
 - (c) momentum transfer
 - (d) all of these
11. Phytometer method is generally used for the measurement of
 - (a) interception
 - (b) transpiration
 - (c) evaporation
 - (d) precipitation
12. For determination of average annual precipitation in a catchment basin, the best method is
 - (a) Arithmetical method
 - (b) Thiessen's mean method
 - (c) Algebraic method
 - (d) Isohyetal method
13. Rain simulators are used for the determination of
 - (a) infiltration capacity
 - (b) evaporation
 - (c) run off
 - (d) precipitation
14. A unit hydrograph is a hydrograph of a rain storm of a specified duration resulting from a runoff of
 - (a) 15 mm
 - (b) 20 mm
 - (c) 25 mm
 - (d) 30 mm
15. Precipitation caused due to upward movement of warmer air as compared to surrounding air is called
 - (a) cyclonic precipitation
 - (b) orographic precipitation
 - (c) convective precipitation
 - (d) conductive precipitation
16. In India, the recording type rain gauge generally used is
 - (a) weighing type
 - (b) float recording type
 - (c) tipping type
 - (d) orographic type
17. A well is considered to be good if it is sunk into
 - (a) Clay
 - (b) Sand
 - (c) Coarse gravel
 - (d) Silt
18. Perched aquifers generally occur
 - (a) above water table
 - (b) below water table
 - (c) in acquicludes
 - (d) in artesian aquifers
19. A confined bed of impervious material between aquifers is known as
 - (a) gravity springs
 - (b) surface springs
 - (c) artesian springs
 - (d) acquicludes
20. Continuous flow of water can be expected from
 - (a) gravity springs
 - (b) surface springs
 - (c) artesian springs
 - (d) acquicludes

21. The sewer which transports the sewage to the point of treatment is called
(a) main sewer (b) lateral sewer
(c) branch sewer (d) out-fall sewer
22. The sludge does not contain waste water from
(a) bathrooms (b) wash basins
(c) kitchen sinks (d) toilets
23. Fresh sewage is generally
(a) neutral (b) acidic
(c) alkaline (d) none of these
24. In sewage having fully oxidised organic matter, the nitrogen exists in the form of
(a) nitrites (b) nitrates
(c) free ammonia (d) aluminoid nitrogen
25. Hardness of water can be removed by boiling if it is due to the presence of
(a) calcium bicarbonates (b) calcium sulphates
(c) calcium chloride (d) calcium nitrates
26. The compound used to control the growth of algae in reservoirs is
(a) bleaching powder (b) lime solution
(c) copper sulphate (d) alum
27. The most commonly used chemical for dechlorination of water is
(a) sodium sulphite (b) sodium thiosulphate
(c) sodium bisulphate (d) sodium chloride
28. Permanent hardness of water can be removed by
(a) adding alum (b) adding chlorine
(c) zeolite process (d) all of these
29. The coagulant widely used for sewage treatment is
(a) alum (b) ferric sulphate
(c) ferric chloride (d) bleaching powder
30. Dissolved carbon dioxide can be removed from the water supply mains by
(a) aeration (b) chlorination
(c) coagulation (d) all of these
31. Which of the following turbines is suitable for specific speed ranging from 300 to 1000 and heads below 30 m?
(a) Francis (b) Propeller
(c) Pelton wheel (d) Kaplan
32. Which of the following turbines is suitable for high head and low discharge?
(a) Francis (b) Propeller
(c) Pelton wheel (d) Kaplan

33. Specific speed of a Pelton wheel turbine ranges from
(a) 12 to 70 (b) 80 to 400
(c) 300 to 1000 (d) 1000 to 1200
34. A Kaplan turbine is
(a) an inward flow impulse turbine (b) low head axial flow turbine
(c) high speed axial flow turbine (d) high head mixed flow turbine
35. A modern Francis turbine is
(a) an inward flow impulse turbine (b) low head axial flow turbine
(c) a high speed axial flow turbine (d) a mixed flow type turbine
36. The centrifugal pump acts as a reverse of
(a) an inward flow impulse turbine (b) an inward radial flow reaction turbine
(c) an inward axial flow reaction turbine (d) a mixed flow type turbine
37. The delivery valve, while starting centrifugal pump, is kept
(a) fully closed (b) fully open
(c) half open (d) in any position
38. If requirements of net positive suction head (NPSH) for a given pump are not satisfied, the pump will
(a) consume more power (b) get cavitated
(c) not develop head (d) have a low efficiency
39. Reciprocating pumps are essentially X speed machines. Find the appropriate replacement for X.
(a) very high (b) high
(c) medium (d) low
40. In a hydro-electric power plant, the turbine used is Pelton wheel. A conical needle is deliberately pushed forward into the nozzle to reduce the amount of water striking the runner. On the other hand, when this needle is pushed back, the amount of water striking the runner increases. This needle is known as
(a) vanes (b) runner
(c) spear (d) penstock
41. Useful soil moisture for plant growth is
(a) capillary water (b) gravity water
(c) hygroscopic water (d) chemical water
42. For cereal crops the most commonly adopted method of irrigation is
(a) sprinkler irrigation method (b) furrow method
(c) free flowing method (d) check method
43. For standing crops in undulating sandy fields, the best method of irrigation is
(a) sprinkler irrigation method (b) furrow method
(c) free flowing method (d) check method
44. Irrigation canals are generally aligned along
(a) contour line (b) ridge line
(c) valley line (d) straight line

45. Type of canal constructed for draining off water from water logged areas are known as
(a) drains (b) inundation canals
(c) perennial canals (d) valley canals
46. Type of canal constructed for diversion of flood water of rivers is
(a) drains (b) inundation canals
(c) perennial canals (d) valley canals
47. In gravity canals, Full Supply Level (F.S.L) is always
(a) at the G.L. (b) 4 to 5 m above the G.L.
(c) below the G.L. (d) a few cm above the G.L.
48. The ratio of the rate of change of discharge of an outlet to the rate of change in level of water surface in a distributary at its normal depth is
(a) efficiency (b) flexibility
(c) sensitivity (d) modular link
49. The critical gradient for the stability of a structure against seepage pressure according to Khosla's creep theory is
(a) 0 (b) 0.50
(c) 0.75 (d) 1.00
50. A river training work is generally required when the river is
(a) aggrading (b) degrading
(c) meandering (d) scouring

PART - B

(Short Answer Questions (100 Marks))

All questions carry equal marks of 5 each.

Attempt all questions.

*This Part should be answered only on the **Answer Booklet** provided.*

1. State Bernoulli's theorem for steady flow of an incompressible fluid. Derive an expression for Bernoulli's equation from first principle and state the assumptions made for such a derivation.
2. Find the loss of head when a pipe of diameter 200 mm is suddenly enlarged to a diameter of 400 mm. The rate of flow of water through the pipe is 300 litres/s.
3. Define open channel flow. How is this different from flow through pipes? Define Reynold's number, laminar flow and turbulent flow in case of open channel flow.
4. Find the bed slope of trapezoidal channel of bed width 6 m, depth of water 3 m and side slope of 3 horizontal to 4 vertical, when the discharge through the channel is 30 cum/s. Take Chezy's constant $C = 70$.
5. Describe, with a neat sketch, the hydrological cycle.
6. What are the uses of a study of hydrology? Give a proper classification and definition of water available in soil.

7. Define unit hydrograph. What are the basic assumptions of unit hydrograph theory?
8. Describe the various factors affecting the yield of a well.
9. Define disinfection of water. What are the general requirements of disinfectants? Briefly describe the theory of disinfection and the factors on which the efficiency of disinfection depends.
10. Describe the processes of special treatments for removal of tastes and odours carried out before water is supplied for public use.
11. Describe, in brief, the processes of treating industrial wastewaters before disposal.
12. What do you mean by waste water recycling in buildings? Briefly describe the various stages of recycling of waste water.
13. Describe, with a neat sketch, the main parts of a Pelton wheel turbine.
14. A Pelton wheel is to be designed for the following specifications : Head = 380 metres; Speed = 750 rpm. Speed ratio = 0.45; Jet diameter is not to exceed one-sixth of the wheel diameter. Determine the (a) wheel diameter and (b) diameter of the jet.
15. Describe, with a neat sketch, the main parts of a centrifugal pump.
16. Give, with a neat sketch, a general layout of a hydro-electric power plant. Explain, in brief, the various components of the plant.
17. Describe the different kinds of irrigation efficiencies.
18. Describe the causative factors of water logging.
19. Describe the various types of dams constructed across a stream / river in order to form a reservoir.
20. What are the various types of spillways used in dams? Describe them.

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