

MIZORAM PUBLIC SERVICE COMMISSION
DEPARTMENTAL EXAMINATION FOR JUNIOR ENGINEER
UNDER PUBLIC HEALTH ENGINEERING DEPARTMENT,
GOVERNMENT OF MIZORAM.
(JULY-2025)

ENGINEERING PAPER
(MECHANICAL ENGINEERING)

Time Allowed : 3 hours

FM : 100 PM : 40

SECTION - A (Multiple Choice Questions) (50 Marks)

All questions carry equal mark of 1 each. Attempt all questions.

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

1. Which of the following materials is commonly used in hand pump tube wells?
(a) PVC (b) GI
(c) RCC (d) Copper
2. The main purpose of a soak pit in rural sanitation is to:
(a) Allow percolation of wastewater (b) Store drinking water
(c) Trap solid waste (d) Collect rainwater
3. Which one of the following is a reinforced material?
(a) Plain Cement Concrete (b) Brick
(c) Reinforced Cement Concrete (d) Stone
4. HDPE pipes are mostly preferred for:
(a) Electrical wiring (b) Portable water supply due to flexibility
(c) Sewer lines only (d) Road construction
5. The Mizoram Water Supply (Control) Act mainly regulates:
(a) Use and supply of drinking water (b) Construction of dams
(c) Water quality testing (d) River water disputes
6. Which one of the following is an advantage of GI pipes?
(a) High tensile strength (b) Prone to rust
(c) Heavy maintenance (d) Cannot withstand pressure
7. Assam-type buildings are primarily made of:
(a) Stone and RCC (b) Timber and corrugated roofing
(c) GI sheets (d) Glass and steel

8. Which one of these is not a component of rural sanitation?
- (a) Soak pit
 - (b) Night soil disposal
 - (c) Septic tank
 - (d) Storm water drain
9. The term “characterization” in solid waste management refers to:
- (a) Identifying components and types of waste
 - (b) Incinerating solid waste
 - (c) Burying waste
 - (d) Burning waste
10. Rainwater harvesting does not include:
- (a) Roof catchment
 - (b) Ground recharge pit
 - (c) Desalination plant
 - (d) Storage tank
11. Which type of intake is commonly used in rivers?
- (a) Wet intake
 - (b) Direct pumping intake
 - (c) Ground intake
 - (d) Infiltration intake
12. A septic tank system is mainly used in:
- (a) Rural and semi-urban areas
 - (b) Industrial treatment plants
 - (c) Desalination
 - (d) Water distribution
13. What is the unit of measurement for earthwork volume?
- (a) Square meters
 - (b) Liters
 - (c) Cubic meters
 - (d) Tons
14. The pipe appurtenance that releases trapped air in pipelines is:
- (a) Check valve
 - (b) Non-return valve
 - (c) Sluice valve
 - (d) Air valve
15. RCC stands for:
- (a) Rolled Cement Concrete
 - (b) Reinforced Cement Concrete
 - (c) Ready Cement Concrete
 - (d) Rapid Cast Cement
16. Which of the following pipe materials is corrosion-resistant?
- (a) DI
 - (b) CI
 - (c) HDPE
 - (d) ERW
17. The most economical channel section for open flow is:
- (a) Semi-circular
 - (b) Circular
 - (c) Rectangular
 - (d) Trapezoidal
18. The process of separating biodegradable and non-biodegradable waste is called:
- (a) Disposal
 - (b) Segregation
 - (c) Collection
 - (d) Treatment
19. Which of the following is not a type of masonry work?
- (a) Brick
 - (b) Stone
 - (c) RCC
 - (d) Laterite

- 20.** What is the main purpose of trenching in rural sanitation?
- (a) Laying pipelines
 - (b) Disposal of night soil
 - (c) Foundation laying
 - (d) Water harvesting
- 21.** Which structure is built for retaining soil?
- (a) Septic tank
 - (b) Soak pit
 - (c) Infiltration gallery
 - (d) Retaining wall
- 22.** What is the major advantage of ERW pipes?
- (a) High flexibility
 - (b) Corrosion resistance
 - (c) Smooth surface and economical
 - (d) Fire resistance
- 23.** Night soil collection refers to:
- (a) Manual collection of human waste
 - (b) Storage of rainwater
 - (c) Collection of grey water
 - (d) Water sample testing
- 24.** The slope of an open channel affects:
- (a) Width of pipe
 - (b) Flow velocity
 - (c) Temperature
 - (d) Odour level
- 25.** The key reason for conducting a water supply survey is to:
- (a) Increase groundwater level
 - (b) Assess rainfall patterns
 - (c) Improve road network
 - (d) Plan intake and reservoir location
- 26.** Which parameter is not considered in the design of pumping mains?
- (a) Head
 - (b) Flow rate
 - (c) Efficiency
 - (d) Turbidity
- 27.** The efficiency of a pump is the ratio of:
- (a) Head to flow
 - (b) output power to input power
 - (c) Discharge to suction
 - (d) pump speed to flow
- 28.** Multistage centrifugal pumps are used to obtain:
- (a) high discharge
 - (b) high head
 - (c) pumping of viscous fluids
 - (d) high head and high discharge
- 29.** The most commonly adopted pumps in water supplies are:
- (a) centrifugal pumps
 - (b) reciprocating pumps
 - (c) rotary pumps
 - (d) submersible pumps
- 30.** The pump shall not run when:
- (a) NPSHA is greater than NPSHR
 - (b) outside the recommended range
 - (c) water enters into suction pipe
 - (d) NPSHA is less than NPSHR
- 31.** Which process is used to remove dirt and sand from raw water?
- (a) Flocculation
 - (b) Chlorination
 - (c) Sedimentation
 - (d) Aeration

32. Aeration in water treatment plant is the process of:

- (a) Removing Turbidity
- (b) Remove dissolved gases (like $\text{CO}_2, \text{H}_2\text{S}$)
- (c) Filtration
- (d) Disinfection

33. Which one of the following is not a coagulant used in water treatment plant?

- (a) Polyaluminum Chloride (PAC)
- (b) Ferric Chloride
- (c) Aluminum sulphate (Alum)
- (d) Bleaching powder

34. The specific speed of a Centrifugal pump is given by:

- (a) $N_s = \frac{N\sqrt{Q}}{H^{2/3}}$
- (b) $N_s = \frac{N\sqrt{Q}}{H}$
- (c) $N_s = \frac{N\sqrt{Q}}{H^{3/4}}$
- (d) $N_s = \frac{N\sqrt{Q}}{H^{1/3}}$

35. The process of filling the suction pipe, casing and impeller of a pump with liquid before starting of pump is called-

- (a) Water Hammer
- (b) Priming
- (c) Suction
- (d) Cranking

36. Excessive black smoke from a DG set indicates:

- (a) High efficiency
- (b) Incomplete fuel combustion
- (c) Low oil level
- (d) radiator overheating

37. Electrical Motor converts electrical energy into:

- (a) Thermal energy
- (b) Potential energy
- (c) Mechanical energy
- (d) Kinetic energy

38. Population forecasting using Arithmetic increase method is suitable for:

- (a) Cities with rapid growth
- (b) Small towns, slow growth
- (c) Developing cities
- (d) Decreasing trend in growth

39. Duty point of a pump is the point where the pump characteristic curve intersects with the:

- (a) system resistance curve
- (b) pump efficiency curve
- (c) suction head
- (d) maximum head

40. The daily clear water demand of rural area having a population of 420 souls at water supply level of 55 lpcd is:

- (a) 25,000 litres
- (b) 28,500 litres
- (c) 23,100 litres
- (d) 2,30,000 litres

41. MLD in water supply stands for:

- (a) Multi Litres per day
- (b) Maximum litres per day
- (c) Millilitres per day
- (d) Million litres per day

42. The discharge of water flowing through a circular pipe of 100 mm diameter, having a velocity of 1.0 m/s is :
- (a) 28.26 m³/hr (b) 30.50 m³/hr
(c) 25.62 m³/hr (d) 38.26 m³/hr
43. In a field hydrostatic test, the test pressure is typically:
- (a) 2.5 times working pressure (b) 1.5 times working pressure
(c) equal to the working pressure (d) 2.0 times working pressure
44. Which one of the following is not a component of water treatment plant:
- (a) Rapid sand filter (b) Flocculator
(c) Transformer (d) Sedimentation tank
45. What is the main purpose of maintaining a logbook in a Water Supply System?
- (a) To record personal attendance
(b) To track daily weather report
(c) To record operational data and performance of system
(d) Sedimentation tank
46. Which welding process is most commonly used for joining steel water supply pipes on-site?
- (a) Arc welding (SMAW) (b) MIG welding
(c) TIG Welding (d) Laser welding
47. Which one is not a common welding defect?
- (a) Slag inclusion (b) Porosity
(c) Crack (d) Galvanizing
48. Which one of the following is a higher pair?
- (a) Cam and follower pair (b) Sliding pair
(c) Turning pair (d) Rolling pair
49. Motion of a piston inside a cylinder is an example of:
- (a) Translatory (linear) motion (b) Rotary motion
(c) Oscillatory motion (d) Circular motion
50. Before starting a DG set, which of the following should be checked first?
- (a) Coolant level (b) Oil level
(c) Fuel level (d) All of the above

Section - B (25 Marks)

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

Marks for each question is indicated against it.

1. Explain the different types of pipes used in water conveyance along with their advantages and disadvantages. (5)
2. Describe the process of survey and site selection for a water supply reservoir. What are the important factors to be considered? (5)
3. What are the types of Hand Pump Tube Wells (HPTW)? Explain their importance in rural water supply. (5)
4. Write short notes on the following: (5×1=5)
 - (a) Two-pit latrines
 - (b) Septic tanks
 - (c) Soak pits
 - (d) Trenching and composting methods
 - (e) Public latrines

OR

Explain the differences between RCC buildings and Assam-type buildings. Mention their suitability and advantages in different geographical areas. (5)

5. Define solid waste management and explain its characterization and segregation processes. (5)

OR

Discuss the design and advantages of trapezoidal and rectangular sections in open channel flow. Which one is considered more economical and why?

Section - C (25 Marks)

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

Marks for each question is indicated against it.

6. Write down four differences between CI and SI engines. What are Cetane number and Octane number? (8+2)
7. Describe the different types of pumps used in water supply system and their applications. (8)

OR

Describe the different types of pipes used in water supply system and their applications. (8)

8. What is population Forecasting? Describe 3 (three) methods of Population Forecasting. (1+6=7)

OR

Explain the procedure for conducting a survey and preparing a repair estimate for pumping equipment in water supply system. (7)