MIZORAM PUBLIC SERVICE COMMISSION

Departmental Examinations for Junior Grade of M.E.S. (AE/SDO) under Public Health Engineering Department, Government of Mizoram, June-2024.

ENGINEERING PAPER – I

(Common for Civil, Electrical and Mechanical Engineers)

Time Allowed : 3 hours   FM : 100 PM : 40

SECTION - A *(Multiple Choice questions) (40 Marks)*

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

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

Direction (Questions No. 1-40) : Choose the correct Answers.

1. In Rule 7 (19) of the Mizoram Water Supplies (Control) Rules, 2023 defines
    (a) Rate of water and other charges
    (b) Right of reservation of water sources with the catchment areas for human consumption.
    (c) Prohibition of constructions over water mains
    (d) Monthly water bills shall be paid to whom undertaking operation and maintenance.

2. The unit of electrical power is
    (a) Radians
    (b) Newton (N)
    (c) Watt
    (d) Joule

3. The main function of centrifugal pumps are to
    (a) Transfer speed
    (b) Transfer pressure
    (c) Transfer temperature
    (d) Transfer energy

4. Electric power is a
    (a) Vector quantity
    (b) Scalar quantity
    (c) Dimensionless quantity
    (d) Infinite quantity

5. The inlet passage of water entry is controlled by
    (a) Head race
    (b) Gate
    (c) Tail race
    (d) Pump

6. Why are galvanized pipes not suitable for steam lines?
    (a) Low pressure to withstand steam.
    (b) Properties of steel having low ductility
    (c) Flake off zinc coating
    (d) Limitation of it strength

7. The Current Electricity is defined as
    (a) The flow of electrons from one section of the circuit to another.
    (b) The flow of protons within the circuit.
    (c) The protons and neutrons induce charge
    (d) The flow of electrons in the circuit produces uniform electricity.

8. The Mizoram Water Supplies (Control) Rules, 2023 supersedes
    (a) The Mizoram Water Supplies (Control) Acts, 2004
    (b) The Mizoram Water Supplies (Control) Rules (Amendment), 2011
    (c) The Mizoram Water Supplies (Control) Rules, 2006
    (d) Decentralization of water Supply and sanitation of rural habitation 2018

9. Overall efficiency of a centrifugal pump is
    (a) Product of manometric and mechanical efficiencies.
    (b) Ratio of manometric efficiency to mechanical efficiency.
    (c) Product of manometric and hydraulic efficiency
    (d) Ratio of mechanical efficiency to manometric efficiency.

10. The electromagnetic force is a force that acts between
    (a) Magnetic field and electromotive force.   (b) Electrical and magnetic forces.
    (c) Conductor and capacitor   (d) Transformer and circuit breaker.

11. Electromagnetic waves are propagated by oscillating electric and magnetic waves at
    (a) right angles to each other.   (b) parallel to each other
    (c) in the form of circle   (d) 45° to each other.

12. What is the definition of density ?
    (a) Velocity per unit area of a liquid   (b) Area per unit perimeter of a liquid
    (c) Mass per unit volume of a liquid   (d) Discharge per unit nozzle of a liquid

13. Which of the following is a positive displacement pump?
    (a) Reciprocating pump   (b) Propeller pump
    (c) Centrifugal pump   (d) Jet pump

14. Centrifugal pumps dealing with muds have an impeller of the type
    (a) Double suction   (b) One -side shrouded
    (c) Open   (d) Two-sides shrouded

15. What is the fundamental principle of operation for a centrifugal pump?
    (a) It employs gears and rotors to generate pressure
    (b) It uses centrifugal force to increase fluid velocity and create pressure
    (c) It uses reciprocating motion to move fluid
    (d) If relies on the venturi effect to boost fluid flow.

16. For operating point of the pump, a system characteristic between the head required 'H' and the discharge to be maintained 'Q' is generally expressed as
    (a) Linear equation   (b) Parabolic equation
    (c) Exponential equation   (d) Cubic equation

17. Elevation pressure is created by elevation differences which of the following?
    (a) The hose and the pump   (b) The nozzle and the pump
    (c) The hose and the hydrant   (d) The nozzle and the hose

18. What element is added to water to prevent tooth decay?
    (a) Chlorine   (b) Sugar
    (c) Fluoride   (d) Nitrate

19. Which one of the following is a water borne disease?
    (a) Influenza
    (b) Small pox
    (c) Malaria
    (d) Cholera

20. Which of the following is a biodegradable form of solid waste?
    (a) Plastic
    (b) Compost
    (c) Glass
    (d) Dumping

21. What is black water?
    (a) It is waste water discharged from toilet
    (b) Waste water from the bathroom
    (c) Waste water from the kitchen sink
    (d) Grey water mixed with effluent

22. Which stream animal is an indicator of poor water quality?
    (a) a black fly larva
    (b) a caddis fly larva
    (c) a May fly larva
    (d) a riffle beetles

23. What happens during the disinfection step at a wastewater treatment plant?
    (a) scum and sludge are separated from the liquid wastewater
    (b) treatment with chlorine or ultraviolet light to kill pathogens
    (c) liquid wastewater is mixed with air to help bacteria breakdown small particles of solid material
    (d) large solid things are screened out.

24. The full form of NABL is
    (a) National Accreditation Board Limited.
    (b) National Accountancy Board of Licencing
    (c) National Acreditation Board for Calibration and Testing Laboratories.
    (d) National Acreditation Board for Water Quality Laboratories.

25. What role do non-governmental organizations (NGOs) play in protecting water quality?
    (a) they pass water protection laws, assign protection to an agency and provide funding for enforcement
    (b) they encourage passage of water protection laws and support their enforcement
    (c) they decide if a water quality protection law or regulation is being broken
    (d) they set specific standards for water protection laws, help people, businesses and other agencies follow them and enforce them when they are not followed

26. Which of the following is not a type of waste water?
    (a) Sullage
    (b) Sewage
    (c) Grey water
    (d) Black water

27. In which year was the Swachh Bharat Mission launched?
    (a) 2019
    (b) 2010
    (c) 2012
    (d) 2014

28. Under which rule of Government, guidelines for solid waste management are followed today?
    (a) Municipal Solid Waste Management Rules, 2000
    (b) Municipal Solid Waste Management Rules, 2016
    (c) Solid Waste Management Rules, 2000
    (d) Rural Solid Waste Management Rules, 2016

29. Which gas produced in open dumps from the decomposition of biodegradable waste?
    (a) Ethane
    (b) Methane
    (c) Propene
    (d) Ethene

30. For water supply design of a town or city, the suitable method of estimating future population by the end of the design period is
    (a) Increasing rate method
    (b) Decreasing rate method
    (c) Exponential curve method
    (d) Incremental increase method

31. Indian standard for drinking water as per BIS specification is
    (a) IS 20500 - 2000
    (b) IS 11700 -2002
    (c) IS 10500 -2012
    (d) IS 70200 -2017

32. As per IS 296 -1975 initial settling time of ordinary cement is
    (a) 15 minutes
    (b) 30 minutes
    (c) 45 minutes
    (d) 60 minutes

33. The process by which water enters the small pore spaces between particles in soil or rocks is
    (a) transpiration
    (b) inflitration
    (c) precipation
    (d) sublimation

34. The best groundwater reservoirs have
    (a) low permeability and low porosity
    (b) low permeability and high porosity
    (c) high permeability and low porosity
    (d) high permeability and high porosity

35. The boundary between the saturated zone and the unsaturated zone is called the
    (a) water table
    (b) aquifer
    (c) aquiclude
    (d) porosity

36. Which is the fastest method of drilling and especially useful in unconsolidated formations?
    (a) Cable tool method
    (b) Water-jet boring method
    (c) Hydraulic Rotary method
    (d) Reverse Rotary method

37. What are the ingredients of concrete?
    (a) Binding material
    (b) Fine aggregate
    (c) Admixtures
    (d) Hard aggregate

38. Which of the following cement is used in sewage and water treatment plants?
    (a) Sulphate Resisting Cement
    (b) Quick Setting Cement
    (c) Low Heat Cement
    (d) Rapid Hardening Cement

39. High strength concrete is defined purely on the basis of
    (a) Tensile strength
    (b) Compressive strength
    (c) Good Aggregates
    (d) Poor Aggregates

40. Which of the following can be recycled many times?
    (a) Wood
    (b) Plastic
    (c) Aluminum
    (d) Organic materials

SECTION - B *(60 Marks)*

Marks for each question is indicated against it.
*This Section should be answered only on the **Answer Sheet** provided.*

Direction (Questions No. 1-5) : Short Answers(Answer ANY FOUR)   (4×5=20)

1. What are the difference between twin pit and septic tank in term of merit and demerit?

2. Write all the electrical equipment must be installed in power sub-station.

3. Name the various methods for population forecasting. What is the current norm of water supply level for both rural and urban area?

4. Mention the factors affecting for the selection of a particular type of pump.

5. Elaborate feacal sludge management and also give comments on suitable system to be adopted for feacal sludge treatment plant in Mizoram.

Direction (Questions No.6-10) : Long Answers (Answer ANY FOUR)   (4×10=40)

6. Clasify common solid wastes which are fast degrading environment in Mizoram. How do you suggest the most suitable method for management of these solid wastes? Explain safe disposal of hazardous wastes.

7. Name three types of electric motors. Explain one type out of the three electric motors. Write the complete schedule of preventive maintenance of electrical motors.

8. What type of pump is most reliable and commonly use in Mizoram? Explain in brief. Write the complete schedule of preventive maintenance of centrifugal pumps.

9. Excessive high turbidity of water impairs the efficiency of water treatment plant. Give your comments to prevent drinking water supply from high turbidity. How to improve existing system of water treatment plant to cope up with the increasing contamination of water sources?

10. Water has to be supplied to a town with one lakh population at the rate of 150 litres per capita per day from the river, 1.8 km away. The difference in elevation between the lowest water level in the sump and service reservoir is 36 metres. Determine the size of the main and the power of the pump required. Assume suitable data if necessary.

     OR

     What do you mean by solar pumping water supply scheme? Elaborate the success story of solar water pumping scheme in Mizoram.

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