

# MIZORAM PUBLIC SERVICE COMMISSION

## DEPARTMENTAL EXAMINATIONS FOR JUNIOR GRADE OF M.E.S. (AE/SDO) UNDER PUBLIC HEALTH ENGINEERING DEPARTMENT, GOVERNMENT OF MIZORAM, DECEMBER, 2019.

### ENGINEERING PAPER – I (Common for all branches of Engineering)

Time Allowed : 3 hours

FM : 100 PM : 40

*The figures in the margin indicate full marks for the questions.*

*Attempt all questions.*

**Direction (Questions No. 1 - 40) : Multiple Choice Question :**

**(40×1=40)**

1. The efficiency of a centrifugal pump is maximum when its blades are
  - (a) bent forward
  - (b) bent backward
  - (c) bent forward first and then backward
  - (d) bent backward first and then forward
2. Positive and negative terminals of direct current have
  - (a) no polarity
  - (b) fixed polarity
  - (c) variable polarity
  - (d) always negative polarity
3. The most common method of rainwater harvesting in Mizoram is
  - (a) Rooftop rainwater harvesting
  - (b) Syntax and RCC storage tank
  - (c) Collection by gutter and store at GCI tank
  - (d) Traditional rooftop rainwater harvesting
4. When a piping system is made up primarily of friction head and very little of vertical lift, then pump characteristics should be
  - (a) horizontal
  - (b) nearly horizontal
  - (c) steep
  - (d) first rise and then fall
5. In what way rainfall measured?
  - (a) Vertical depth
  - (b) Horizontal area
  - (c) Catchment area
  - (d) At slope
6. The overload release protects the motor against
  - (a) Over voltage
  - (b) Over current
  - (c) Over load
  - (d) All of these
7. Centrifugal pump is started with its delivery valve
  - (a) kept fully closed
  - (b) kept fully open
  - (c) irrespective of any position
  - (d) kept 50% open

8. Biochemical Oxygen Demand (B.O.D.) of safe drinking water must be
  - (a) nil
  - (b) 5
  - (c) 10
  - (d) 15
9. The means of promoting hygiene through the prevention of human contact with the hazards of wastes especially feces is called
  - (a) Hygiene control
  - (b) Disease prevention
  - (c) Sanitation
  - (d) Hygiene
10. The relatively clean wastewater from baths, sinks, washing machines and other kitchen appliances is called
  - (a) Grey water
  - (b) Black water
  - (c) Yellow water
  - (d) Wastewater
11. Movement and filtering of fluid from porous material is called as
  - (a) Percolation
  - (b) Infiltration
  - (c) Transpiration
  - (d) Precipitation
12. In DOL fuses are provided to protect against
  - (a) Short circuit protection
  - (b) Over voltage
  - (c) Over current
  - (d) Over load
13. Which of the following is a biodegradable form of solid waste?
  - (a) Plastic
  - (b) Compost
  - (c) Glass
  - (d) Biogas
14. The MES Rules in force at present is called
  - (a) The MES Rules 1995
  - (b) The MES Rules 2001
  - (c) The MES Rules 2013
  - (d) The MES (Amendment) Rules 2018
15. Which one of the following gases plays a decisive role in affecting the climate of earth?
  - (a) Oxygen
  - (b) Nitrogen
  - (c) Carbon dioxide
  - (d) Hydrogen
16. Which one of the following is a water borne disease?
  - (a) Influenza
  - (b) Small pox
  - (c) Malaria
  - (d) Cholera
17. Which process is used to remove dirt and sand from wastewater?
  - (a) Aeration
  - (b) Chlorination
  - (c) Sedimentation
  - (d) Flocculation
18. Time interval after which alternative current voltage or current repeats its value is called its
  - (a) frequency
  - (b) time period
  - (c) amplitude
  - (d) wavelength
19. The multiplying factor, as applied to obtain the peak hourly demand, in relation to the maximum daily demand (per hour of course) is :
  - (a) 1.5
  - (b) 1.8
  - (c) 2.0
  - (d) 2.7

20. The suitable method for forecasting population for a young and a rapidly developing city is :
- (a) Arithmetic mean method (b) Geometric mean method  
(c) Comparative graphical method (d) None of these
21. A geological formation, which not only stores water, but can yield it in sufficient quantity, is known as an :
- (a) aquiclude (b) aquitard  
(c) aquifer (d) aquifuse
22. In a centrifugal pump, the liquid enters the pump
- (a) at the top (b) at the bottom  
(c) at the center (d) from sides
23. The internal pressure, to which a water supply pipe is subjected to, is :
- (a) Full hydrostatic pressure when water in the pipe is at rest  
(b) Pressure head and velocity head in the pipe, when flow at full velocity is taking place  
(c) (a) + water hammer pressure  
(d) (b) + water hammer pressure
24. If induction motor is direct switched-on then it will develop
- (a) 1.5 times their full load torque (b) 1.5 to 2.5 times their full load torque  
(c) 2.5 times their full load torque (d) 1.5 to 5 times their full load torque
25. Water hammer pressures can be reduced by using :
- (a) Fast closing valves (b) slow closing valves  
(c) Critically closing time, valves (d) none of these
26. Steel pipes are :
- (a) Easily affected by acidic and alkaline atmospheric effects  
(b) Unable to withstand high negative pressures  
(c) Liable to quick rusting  
(d) All of these
27. The valve, which is provided in the water distributing pipes at street corners and pipe junctions to control the flow in the distribution system, is
- (a) An air valve (b) a sluice valve  
(c) A scour valve (d) a reflux valve
28. In transformer, alternating current is induced in
- (a) primary coil (b) secondary coil  
(c) iron core (d) resistor
29. Summits are the points of
- (a) High pressure (b) Low pressure  
(c) Equal pressure (d) None of these
30. The turbidity, which can be seen easily on naked eye, is of the order of :
- (a) 1 Jtu (b) 2 Jtu  
(c) 3 Jtu (d) 5 Jtu

31. Blue baby disease may be caused in infants due to drinking waters, containing higher concentrations of :
- (a) nitrites (b) nitrates  
(c) lead (d) arsenic
32. The maximum allowable concentration of iron in water is :
- (a) 1.0 ppm (b) 0.05 ppm  
(c) 0.3 ppm (d) 0.03 ppm
33. A water sedimentation tank, under normal conditions, can remove suspended impurities, up to, say :
- (a) 30% (b) 50%  
(c) 70% (d) 90%
34. The Mizoram Water Supply (control) Rules contain a clause 'The rates of water and other charges mentioned under Rule 7 may be revised by the Department by issue of notification not more than \_\_\_\_\_'.
- (a) twice in a year (b) half yearly  
(c) once in a year (d) three times
35. Slow sand filters remove bacteria, to as much as :
- (a) 80 – 90 % (b) 90 – 95 %  
(c) 98 – 99 % (d) none the these
36. Activated carbon is used in water treatment for removing :
- (a) colour (b) tastes and colour  
(c) turbidity (d) corrosiveness
37. The water meter, which is installed on individual house connections, on municipal supplies, is :
- (a) a velocity meter (b) an inferential meter  
(c) a displacement meter (d) none of these
38. Satisfactory disinfection is obtained by prechlorination to maintain free available residual :
- (a) 0.4 to 0.5 mg/l (b) 0.3 to 0.45 mg/l  
(c) 0.2 to 0.3 mg/l (d) 0.1 to 0.2 mg/l
39. Hand pump India Mark-II and India Mark-III can be easily identify from :
- (a) Water tank (b) Riser  
(c) Casing pipe (d) All of these
40. The advantages of twin pit latrine is
- (a) Night soil collection (b) More costly and requires more space  
(c) Emptying one pit gives manure (d) Lasting use of pit latrine

**Direction (Questions No. 41 - 45) : Short Answers (Answer any 4 (four))**

**(4×5=20)**

41. The annual average rainfall of 2300 mm fall over roof catchment area of 72 m<sup>2</sup> and the run-off coefficient is 0.9. Find the total volume in litre available rainfall for harvesting in the year.
42. What is priming of a centrifugal pump? Explain clearly why priming is essential before starting a centrifugal pump?
43. What is meant by water cement ratio? How does water cement ratio influence concrete strength?
44. What is difference between AC and DC? What is more efficient AC or DC?
45. What is cement setting? What is the minimum curing time for cement concrete?

**Direction (Questions No. 41 - 45) : Descriptive (Answer any 4 (four))**

**(4×10=40)**

46. Design a coagulation-cum-sedimentation tank with continuous flow for a population of 60,000 persons with a daily per capita water allowance of 120 litres. Assume max. demand as 1.8 times the average daily demand. Detention period is taken as 4 hours. Assuming overflow rate of 1000 litres/hr/m<sup>2</sup> of plan area.
47. What do you mean by Solid Waste Management? What are the environmental impact of solid waste disposal off on land in open dumps? What do you suggest the most appropriate technology for final disposal of wastes in Mizoram? Write the method of leachate collection and safe disposal?
48. What are the type of intakes? Mention the factors to be considered for location of intakes. How do you suggest preventing from entry of turbid water and deposit of silt inside the intake well?
49. A centrifugal pump delivers 25 liters of water per second against a head of 10 meters and running at 1300 rpm requires 10 kW of power. Determine the discharge, head of pump and power required if the pump runs at 1500rpm.
50. Design six slow sand filter beds from the following data :  
Population to be served = 50,000 persons  
Per capita demand = 150/litres/head/day  
Rate of filtration = 180 litres/hr./sq.m  
Length of each bed = Twice the breadth  
Assume max. demand as 1.8 times the average daily demand  
Also assume that one unit, out of six, will be kept as standby.

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