MIZORAM PUBLIC SERVICE COMMISSION

DEPARTMENTAL EXAMINATIONS FOR JUNIOR GRADE OF M.E.S. (AE/SDO) UNDER PUBLIC HEALTH ENGINEERING DEPARTMENT, GOVERNMENT OF MIZORAM, JULY, 2022.

ENGINEERING PAPER – I

(Common for Civil, Electrical and Mechanical Engineers)

Time Allowed : 3 hours FM : 100 PM : 40

Marks for each question is indicated against it.
Attempt all questions.

Direction (Questions No. 1 – 40) : Choose the correct Answers. **(40×1=40)**

1. The most commonly adopted pumps in water supplies are
(a) centrifugal pumps (b) reciprocating pumps
(c) rotary pumps (d) submersible pumps

2. The driving motor is placed below the pump bowl in a
(a) turbine pump (b) monoblock pump
(c) submersible pump (d) hydraulic rams

3. One horsepower is equal to
(a) 102 watts (b) 75 watts
(c) 550 watts (d) 735 watts

4. Multistage centrifugal pumps are used to obtain
(a) high discharge (b) high head
(c) pumping of viscous fluids (d) high head and high discharge

5. In a single casing, multistage pump running at constant speed, the capacity rating is to be slightly lowered. This can be done by
(a) designing new impeller
(b) trimming the impeller size to the required size by machining
(c) not possible
(d) some other alterations in the impeller

6. The shaft horse power required will be
(a) $\frac{\omega \times Q \times H}{\eta}$ hp (b) $\frac{\omega \times Q \times H}{75\eta}$ hp
(c) $\frac{\omega \times Q \times H}{70\eta}$ hp (d) $\frac{\omega \times Q \times H}{80\eta}$ hp

7. For small discharge at high pressure which of the following pump is preferred
(a) centrifugal (b) axial flow
(c) mixed flow (d) reciprocating

8. Low specific speed of a pump implies that it is
(a) centrifugal (b) mixed flow pump
(c) axial flow pump (d) rotary pumps

9. On delivery end of each of the pump a non-return valve shall be fitted
(a) after gate valve at delivery side. (b) Between pump and gate valve.
(c) Between reflux valve and pump. (d) Before surge tank.

10. The pump shall not run when
(a) NPSHA is greater than NPSHR (b) water enters into suction pipe.
(c) outside the recommended range. (d) dynamic head is too high.

11. The power sub-station should not have
(a) overhead bus bar (b) fencing
(c) generator (d) transformer

12. Occurrence of single phasing on three phase motor will cause
(a) increase efficiency (b) regulate voltage
(c) overheating (d) full load of induction motor.

13. Windings of star-delta starter while starting and during running are connected in
(a) Star, delta (b) Delta, delta
(c) Star, star (d) Delta, star

14. Time interval after which alternative current voltage or current repeats its value is called its
(a) frequency (b) time period
(c) amplitude (d) wavelength

15. Current produced by AC generators is
(a) alternative current (b) fixed current
(c) negative current (b) direct current

16. Direct online starter also called D.O.L. starter is used for motors having capacity
(a) Less than 5 h.p. (b) Less than 10 h.p.
(c) Greater than 10 h.p. (d) For any capacity motor

17. A motor should never be expected to operate continuously beyond
(a) ± 10 % voltage (b) ± 5% voltage
(c) ± 7.5 voltage (d) ± 1 % voltage

18. The cheapest starter for induction motor is
(a) stator resistance starter (b) autotransformer starter
(c) star-delta starter (d) rotor resistance starter

19. In transformer, alternating current is induced in
(a) primary coil (b) secondary coil
(c) iron core (d) resistor

20. Positive and negative terminals of direct current have
(a) no polarity (b) fixed polarity
(c) variable polarity (d) always negative polarity

21. The faults in motor is detected with mechanical noise, the possible cause is due to
(a) excessive load (b) bearing damaged
(c) foreign matter in air gap (d) control gear open circuited

22. In the present of sewerage system, water required per head per day for average domestic purposes, is
(a) 70 (b) 120
(c) 135 (d) 110

23. In slow sand filters, the turbidity of raw water can be removed only up to
(a) 60 mg/litre (b) 75 mg/litre
(c) 100 gm/litre (d) 150 gm/litre

24. Increase in population of a rapidly growing city, may be estimated by
(a) arithmetical mean method (b) geometrical method
(c) incremental increase method (d) graphical comparison method.

25. The process of passing water through beds of granular materials, is called
(a) screening (b) sedimentation
(c) filtration (d) coagulation

26. The maximum pressure which the pipe can withstand without any leakage during hydrostatic pressure test, is called
(a) Working pressure (b) Design pressure
(c) Test pressure (d) Hydrostatic pressure.

27. The storage capacity of a reservoir may be divided into three zones. The lowest zone is
(a) dead storage (b) useful storage
(c) surcharge storage (d) sludge zone.

28. Raw water treated with only chlorine, is known as
(a) plain chlorination (b) pre-chlorination
(c) first chlorination (d) de-chlorination

29. P.V.C. pipes can withstand pressure bead of water upto
(a) 25m (b) 50m
(c) 75m (d) 100m

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

31. How does a pit toilet or latrine work?
(a) by separating sludge and scum from the liquid wastewater.
(b) by holding feaces and urine in a pit or tank until it can be removed for further treatment.
(c) by allowing feaces and urine to flow directly to a drain field for bacteria to continue their work.
(d) by mixing in air to speed up the breakdown of liquid wastewater.

32. What is the common device used for water hammer preventive measure in Mizoram?
(a) surge tank (b) sluice and drain valve
(c) reflux valve (d) air vessel

33. What is the measuring instrument for recording rain water?
(a) nonrecording guage (b) symon's gauge
(c) gauging stream (d) open air bucket

34. The yield of water ground source can be determined which of the following method?
(a) Installation of hand pump tube well (b) ground water recharge
(c) recuperative test (d) Hydraulic test

35. The factor affecting selection for location of intake is

(a) Intake structure (b) dimension of pump house

(c) firm strata (d) depth of jack well

36. The year of publication of Mizoram Water Supply (Control) Acts & Rules are

(a) 1994 & 2004 (b) 2000 & 2006

(c) 2004 & 2006 (d) 2006 & 2016

37. Which process is used to remove dirt and sand from wastewater?

(a) Aeration (b) Chlorination

(c) Sedimentation (d) Flocculation

38. Sanitation means for promoting health through prevention of human contact with the hazards of waste in

(a) hygienic (b) proper

(c) better (d) perfect

39. What is the single most effective way to prevent the transmission of disease?

(a) antibiotics (b) hand washing

(c) condoms (d) consult doctor

40. The chemical commonly used in water treatment plant as coagulant is

(a) calcium hydroxide (b) nitrogen sulphate

(c) aluminum sulphate (d) zinc sulphate

Direction (Questions No. 41 – 45) : Short Answers (Answer ANY FOUR) **(4×5=20)**

41. What is the general working principle of pump and write the types of pump. Explain why centrifugal pump is commonly used for pumping drinking water supply.

42. Name all pipes commonly used for conveyance of water supply in Mizoram. How to select most suitable pipe for transporting drinking water to the end users?

43. Draw the schematic flow diagram of conventional water treatment plant. Give your suggestion on how to prevent the escalating contamination and pollution of water sources with most appropriate treatment method.

44. What is difference between AC and DC motor? There are common faults with motor, elaborate particular one fault with possible cause of faults and also mention corrective action to be taken for that one fault.

45. What do you mean by water hammer? How to take preventive measures to create moderate transient pressure inside the pipeline.

Direction (Questions No. 46 – 50) : Descriptive (Answer ANY FOUR) **(4×10=40)**

46. Design the approximate dimension of rapid gravity filter for treating water required for a population of 50000, the rate of supply being 180 litres per capita per day. The filters are rated to work 5000 litres per hour per square metre. Assume the maximum daily demand is 1.8 times the average daily demand and length = 1.5 width.

47. What do you mean by Solid Waste Management? What is difference between municipal solid waste and rural solid waste? Suggest the most appropriate technology for final disposal of wastes and explain the methodology.

48. What do you mean by sanitation? Give your suggestion which one is most suitable method for safe disposal of human faeces and also mention the working principle to support your suggestion.

49. A centrifugal pump driven by electric motor lifts water through a total height of 50 metres from the reservoir to the discharge end. The pump efficiency is 77% and the motor efficiency is 85%. The lift is through 300 metres length which is of 10 cm in diameter and the pumping rate is 1500 litres per minutes given that $4f = 0.025$. Determine the discharge, head of pump and power required in kilowatt.

50. What is the difference between recycle and reuse of wastes? Define the method of sanitary landfill for solid wastes disposal.

OR

What is the precise definition for the following terminology of -

(a) Sewage
(b) Sewerage
(c) Sewer
(d) Sullage

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