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 – II
CIVIL ENGINEERS

Time Allowed : 3 hours   FM : 100   PM : 40

Marks for each question is indicated against it.

Attempt all questions.

PART – A (50 MARKS)

1. Using Hazen-William's formula, calculate required size of pipe flowing full under gravity when coefficient is 100, head loss is 20 metre, length of pipeline is 1,500 metre and velocity is 0.9 metre per second.   **(4)**

2. Using Darcy-Weisbach's formula, find frictional loss if a centrifugal pump driven by an electric motor lifts water at the rate of 15,000 litre per minute from a sump to a main reservoir having a level difference of 500 metre. The pumping main pipe length is 3,000 metre and its size is 100 millimeter with frictional coefficient of 0.025. Also find total head against which the pump has to work and power required in Kilo Watts if the pump efficiency is 77% and the motor efficiency is 85%.   **(6)**

3. Define water hammer and name any two devices used to reduce water hammer in water pumping pipeline.   **(1+0.5+0.5=2)**

4. Draw neat diagrams showing elevation and plan for one brick wall English bond and one brick wall Flemish bond.   **(1+1=2)**

5. What do you mean by Fe 500 of High Yield Strength Deformed bar?   **(1)**

6. Explain safe bearing capacity of soil.   **(2)**

7. Draw neat diagrams showing elevation and plan for combined footing.   **(1+1=2)**

8. Differentiate between working principles of horizontal flow sedimentation tank and vertical flow sedimentation tank.   **(1+1=2)**

9. Define theory of sedimentation aided with coagulation and flocculation.   **(2)**

10. How do you clean slow sand filter after a long time of use?   **(1)**

11. What is the importance of air compressor in rapid sand filter?   **(2)**

12. What is residual chlorine in water disinfection? Give its importance.   **(2+2=4)**

13. How do you remove iron from water?   **(2)**

14. Write a note on surface sources and sub-surface sources?   **(2)**

15. Discuss any two preventive measures for source depletion?   **(2)**

16. Explain the impacts of water cement ratio on concrete.   **(2)**

17. What is the meaning of M 10 grade of concrete? **(1)**

18. Give the differences between under-reinforced section and over- reinforced section. **(1+1=2)**

19. Find the bending moment at the base of a cantilever beam of length 1.2 metre carrying 10 N/m uniformly distributed load. **(4)**

20. Discuss minimum reinforcement steel for wall of water tank. **(2)**

21. What is the minimum permissible grade of concrete for water tank? **(1)**

22. Discuss the importance of clear cover to reinforcement steel? **(2)**

PART – B (MARK 50)

1. Write a short note on effective solid waste management. **(3)**

2. Give the different colour codes for segregation of solid wastes. **(2)**

3. Discuss the process of incineration for solid waste management with its merits and demerits. **(2+1+1=4)**

4. Elaborate on vermicomposting. **(2)**

5. What do you mean by sanitary landfill? Give the processes involved in sanitary landfill. **(1+2=3)**

6. Discuss the characteristics of domestic sewage. **(2)**

7. Write a note on net quantity of sewage produced. **(3)**

8. Discuss any one of the hydraulic formulas for determining flow velocity in sewer. **(2)**

9. Compare hydraulic conditions of circular sewer and egg shaped sewer. **(1+1=2)**

10. What is manhole? Where will you provide manhole in sewer line? **(1+2=3)**

11. Discuss major components of sewage pumping station and functions of each component. **(3)**

12. Define BOD of sewage and its importance in sewage treatment. **(2+2=4)**

13. Write a note on the processes of self purification of natural river when sewage effluent is discharged into the river. **(4)**

14. Draw a neat flow diagram of conventional sewage treatment plant. **(2)**

15. Discuss activated sludge process for sewage treatment. **(2)**

16. Elaborate on sludge digestion process. **(2)**

17. Design dimensions of a septic tank for a small colony of 50 persons provided with water supply at the rate of 135 lpcd. **(4)**

Assume:
  (a) Volume of sewage   =   80% of water supplied
  (b) Detention time   =   24 hours
  (c) Rate of sludge deposit   =   30 litre/capita/year
  (d) Period of cleaning   =   3 years
  (e) Effective depth of tank   =   1.5 metre
  (f) Ratio of length to width =   3:1

18. Discuss the importance of IS code. **(2)**

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