MIZORAM PUBLIC SERVICE COMMISSION

DEPARTMENTAL EXAMINATIONS FOR JUNIOR GRADE OF M.E.S. (AE/SDO) UNDER PUBLIC HEALTH ENGINEERING DEPARTMENT, GOVERNMENT OF MIZORAM, JUNE, 2023.

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)

Question No.1 is compulsory.

1. (a) What would happen if burning of Brick clay is done at a temperature beyond 1100 °C? **(5)**

(b) Draw a neat diagram of eccentrically loaded Footing along with soil pressure diagram. **(5)**

2. (a) (i) Give examples for steady uniform flow, unsteady uniform flow, steady non-uniform flow and unsteady non-uniform flow. **(4)**

(b) Draw a diagram showing Hydraulic gradient and Total energy line for an inclined pipe carrying liquid from a reservoir discharging freely in the atmosphere at its exit end. **(6)**

(c) Explain how assessment of intake source and knowledge of hydrological cycle is significant for water supply. **(5)**

(d) What is the maximum cement content for construction of water retaining structures? Why is maximum limit stipulated? **(2+3=5)**

OR

(b) (i) Why there can be no flow of fluid across any streamline? **(2)**

(ii) A horizontal channel 4.0m wide carries a discharge of 16 m^3/s. Determine whether a hydraulic jump may occur at an initial depth of 0.5 m or not. If a jump occurs, determine the sequent depth to this initial depth. Also determine the energy loss in the jump. **(2+3+3=8)**

(iii) List the important factors to be considered in designing and locating intakes for water supply. **(5)**

(iv) What is the main reason why IS:3370 (Part-1) -2009 stipulated concrete grade M-30 for construction of water retaining structures? **(5)**

3. (a) (i) Explain how the source of water affects the character and degree of treatment. **(6)**

(ii) What is the benefit of using down flow filter comprising of two media, a bed comprising Anthracite (1.25 – 2.50 mm) which is less dense than the lower layer of 0.5 mm sand. **(4)**

(iii) Calculate the required quantities of cement, sand and coarse aggregate for 1 cum of cement concrete if the mix proportion s 1:2:4. **(3)**

(iv) Explain the mechanism of plastic settlement cracks in concrete. What would be the most efficient way to eliminate the plastic settlement cracks? **(5+2=7)**

OR

(b) (i) What is the difference between sterilization and disinfection? **(2)**

(ii) Design a Rapid sand filter unit for treating 5000000 litres/day supply for a town. The filters are to work day and night. Take 4500 l/m^2/hr as the rate of filtration and half an hour lost in washing, draining ad returning to service after24 hr. **(8)**

(iii) What is the limitation in using $Cacl_2$ as accelerator in cement concrete? **(4)**

(iv) What is the difference between entrapped air and entrained air in cement concrete? What is the purpose of providing entrained air in cement concrete mixes? **(2+4=6)**

PART – B (MARK 50)

Question No.4 is compulsory.

4. Answer the followings as per the provision of IS:456:2000 and IS:3370-Part 1,2 &3 (2009)

(a) In order to control cracking of concrete, what is the maximum rate of filling of the Tank for the first time? **(1)**

(b) Give classification for jointing materials normally used in structures for storage of liquid. **(3)**

(c) What is the Ph value of water required for mixing and curing of plain and reinforced cement concrete? **(1)**

(d) What is attached growth process of sewage treatment? Give examples. **(3+2=5)**

5. (a) (i) Define Solid wastes, municipal Solid wastes and discards. **(1+1+1=3)**

(ii) Briefly explain Integrated solid waste management. **(7)**

(iii) Draw a diagram of Growth pattern of microorganisms with time in the sewage and explain the significance of end of log growth and beginning of declining growth. **(3+2=5)**

(iv) How Dilution and Sunlight affect the process of self-purification of streams? **(5)**

OR

(b) (i) Explain how incineration may reduce the dependency on landfills? What is the significance of reducing dependency on land fill ? **(3+2=5)**

(ii) What are the factors affecting the composing process? **(5)**

(iii) Explain how BOD may be used as a measure of the organic content of the waste? **(3)**

(iv) What is sewage sickness ? Give the ways for its prevention. **(5+2=7)**

6. (a) (i) Draw a typical layout showing trench method of sanitary landfilling. **(5)**

(ii) What is the significance of providing allowable slope in the design of sewers? **(5)**

(iii) How is the geometrical shape of sewer is designed to maintain self-cleansing velocity? **(3)**

(iv) Draw a typical cross-section of sand and oil trap for garages and car washes. **(7)**

OR

(b) (i) What is Leachate in sanitary landfill ? How it may be minimized? **(2+3=5)**

(ii) Discuss the use of larger pipe for sewer in a very flat area in connection with attempting to achieve self-cleansing velocity. **(5)**

(iii) Under what condition Cast iron or steel pipe may be used as sewers? **(3)**

(iv) Draw a typical cross-section of Manhole (either Brick or Concrete) **(7)**

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