MIZORAM PUBLIC SERVICE COMMISSION

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

1. Answer **any five (5)** ot the followings in short simple sentence. **(5×2=10)**

(i) What are the general principles of reinforcement detailing to control cracks in water tank construction ?

(ii) What is the harmful effect of construction done in a temperature above 38°C on cement concrete of water tank?

(iii) What is the minimum grade of concrete to be used for RCC water tank and what is the prescribed minimum cement content per Cubic meter?

(iv) Why an water tank made of cement concrete should not be left empty for a long period of time even before the actual commissioning?

(v) What is the function of provision of initial gap between the adjoining parts of the RCC water tank structure in an expansion joint?

(vi) Why is dead storage provided in a water tank?

2. Write short notes on **any two (2)** of the followings: **(5×2=10)**

(i) Control of deflection and cracking of RCC members in a limit state design method.

(ii) Mechanism of action of super-plasticizer in cement concrete.

(iii) Precautions to be taken before placing of cement concrete in the foundation of structures resting on excavated earth soil.

(iv) When to start curing and how long curing may be done in cement concrete.

3. (i) Reynolds number is defined as Re = Inertia Force/Viscous Force, derive Re= ρ VL/ μ , where ρ & μ are mass density and viscosity of the flowing fluid, V is the representative velocity of flow and L is the characteristic linear dimension. **(5)**

(ii) Why foundations of structures need minimum depth even if the soil properties at site is good enough at the surface level? Suggest steps to be taken if the bearing capacity of the shallow soil layers is inadequate or if the estimated settlements of the shallow foundations are excessive. **(2½ + 2½ = 5)**

(iii) Draw a sketch of water filtration plan (treatment plan) showing coagulation, settling, filtration, post chlorination and clear-water storage. **(10)**

(iv) 'Water that is absolutely pure is not found in nature'- Discuss the statement with reference to hydrological cycle. **(5)**

(v) What are the advantages of TMT bars as a reinforcement in RCC construction? **(5)**

OR

4. (i) Explain with typical velocity profile diagram the location of the maximum velocity of flow in an open deep narrow channel and that for a wider channel of the same depth, depth for both the cases measured from the water surface. **(5)**

(ii) Explain raft foundation. Draw a dimensionless sketches of plain slab raft foundation, slab and beam raft foundation and cellular (buoyancy) raft foundation. **(2+1+1+1=5)**

(iii) Considering the concept of idea sedimentation basin, show that settling velocity of suspended particles is independent of depth of tank and that it depends upon the plan area of the tank. **(10)**

(iv) Give critical discussion on Methemoglobinemia in connection with water supply. **(5)**

(v) What are the advantages of using hollow blocks in construction industries? **(5)**

PART-B (50 MARKS)

5. Answer the followings. **(10×3=30)**

(i) What is meant by inverted siphons in sewerage works?

(ii) How the flushing tank works in a sewerage system?

(iii) Explain the rational method for estimating storm flow.

(iv) What are the main factors governing the shape of the sewers?

(v) Explain how a larger sewer pipes in a very flat area may cause more trouble with reference to the velocity of sewer flow.

(vi) What is the difference between sewage and sewer?

(vii) What are the advantages of waste incineration in hazardous waste treatment technology?

(viii) Explain how leachate in sanitary landfilling may be controlled.

(ix) Explain with suitable examples primary pollutants and secondary pollutants with reference to Air pollution.

(x) Discuss the Anaerobic process and aerobic process in terms of their end products.

6. Write short notes on **any two** of the followings. **(2×5=10)**

(i) Oxygen demanding wastes.

(ii) Effect of eutrophication in water bodies.

(iii) Effect of temperature and photosynthesis in the oxygen sag curve of a river or lakes.

(iv) Carbonaceous oxygen demand (CBOD) and Nitrogenous oxygen demand (NBOD)

7. Fill in the blanks as per the provision of IS:456 (latest edition) and IS:3370 part-1,2,3 & 4 (latest edition). **(5×2=10)**

   (i) For calculating estimated maximum crack width in RCC water tank, the temperature value recommended if concreting is done in summer is _____

   (ii) Pertaining to water tank, concrete surfaces shall kept continuously moist for a minimum period of _____

   (iii) The maximum pitch of lateral ties in columns is _____

   (iv) The maximum bars allowed for welding in a section if 100% strength is to be considered for a joint in tension is _____

   (v) The maximum allowable water-cement ratio for M20 grade cement concrete is _____

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