

MIZORAM PUBLIC SERVICE COMMISSION
DEPARTMENTAL EXAMINATIONS FOR JUNIOR GRADE OF M.E.S. (AE/SDO)
UNDER PUBLIC HEALTH ENGINEERING DEPARTMENT,
GOVERNMENT OF MIZORAM, JUNE-2024.

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. Choose the correct answer in the following : (5×1=5)
- (i) The best hydraulic Rectangular Section occurs when (b = bottom width, h = depth of flow),
 - (a) $h=2b$ (b) $h=b$
 - (c) $h=b/2$ (d) $h=b^2$
 - (ii) The velocity at which the flow changes from laminar flow to turbulent flow is called
 - (a) Velocity of approach (b) Velocity of change
 - (c) Critical velocity (d) Super-Sonic velocity
 - (iii) According to Indian Standard Specifications, the full strength of concrete is achieved after
 - (a) 7 days (b) 14 days
 - (c) 21 days (d) 28 days
 - (iv) Adding of water to cement generates
 - (a) Pressure (b) Heat
 - (c) Energy (d) Workability
 - (v) The maximum pressure that a soil can withstand without rupture in shear or without excessive settlement of the structure is called.
 - (a) Allowable bearing capacity (b) Safe bearing capacity
 - (c) Ultimate bearing capacity (d) Simple bearing capacity
2. Indicate whether the following statements are True or False : (5×1=5)
- (i) The coagulant is not required in Slow Sand Filter
 - (ii) Vicat's Apparatus is used to perform Soundness test.
 - (iii) Present of chloride in concrete increased risk of corrosion.
 - (iv) The walls of a rectangular tank are subject to bending moments both in horizontal as well as vertical direction.
 - (v) Minimum grade of concrete in water tank is M-30

3. Fill in the blanks :

(5×1=5)

- (i) Maximum free water cement ratio in reinforcement is _____
- (ii) The most commonly used disinfectant for drinking water throughout the world is _____
- (iii) A good building stone is one in which does not absorb more than _____ of its weight of water after one days immersion.
- (iv) The initial setting time of ordinary and rapid hardening cement should not be less than _____.
- (v) A foundation is shallow if its depth is _____ or _____ its width.

4. Answer any five(5) of the following questions.

(5×2=10)

- (i) What do you meant by Segregation and Bleeding in concrete?
 - (ii) What is meant by Water Hammer?
 - (iii) Sedimentation with coagulation.
 - (iv) Uniform and Non-Uniform flow in case of channel.
 - (v) Define Characteristic strength of concrete.
 - (vi) Combine Footing and Strap Footing.
5. Design a slow sand filter to treat water for a population of 4000 with rate of water supply at 55 lpcd. The rate of filtration is 200 litres/m²/hrs and maximum water demand is 1.5 times the average demand. The length may be taken as twice the width, one of the three (3) filters may be kept as stand by. (5)
6. A short circular column 400mm is reinforced with six (6) numbers of 16S bars. Find the axial factor load that the column can carry. Use M-20 grade of concrete and Fe415 grade of steel. (5)

OR

Two reservoirs are connected by a pipe 1500m long and 0.125m in diameter. The difference in water level being 12.5 m. determine the flow through the pipe in litres per minute. (Taking co-efficient of friction $f=0.03$)

8. Distinguish between Slow Sand Filter and Rapid Sand Filter with reference to

(5)

- | | |
|--------------------------|-------------------------|
| (i) Rate of filtration | (ii) Method of cleaning |
| (iii) Period of cleaning | (iv) Efficiency |
| (v) Loss of head | |

OR

What are different type of Bricks. Explain in details.

9. How do you test water- tightness of water tank after completion. Explain in brief.

(10)

OR

What are the various sources of water used in water supply scheme. Discuss their merits and demerits from quantity and quality point of view.

PART-B (50 MARKS)

10. Answer the following questions : (5×2=10)
- (i) What the factors affecting self-purification of sewage?
 - (ii) What do you meant by self cleaning velocity in sewerage system?
 - (iii) Why sewer gases should be carefully disposed off in the atmosphere?
 - (iv) What do you meant by sewage farming?
 - (v) What do you meant by combine system sewerage system?
11. Write a short notes on the followings: (5×2=10)
- (i) Skimming tank
 - (ii) Sullage and Night soil
 - (iii) Dilution
 - (iv) Bio-Chemical Oxygen Demand (BOD)
 - (v) Collar joint and Flush joint
12. A 2.0m diameter circular sewer had been laid on a slope of 1 in 500. Calculate the velocity of flow developed while flowing full. Using Manning's formula and Hazen William's formula.
Where,
Hazen William's Constant = 110
Hydraulic mean depth = $d/4$
Roughness coefficient = 0.013 (2.5+2.5 =5)
- OR**
- Why is centrifugal pumps are exclusively used for sewage pumping? (5)
13. What are the uses of chlorination of sewage? (5)
- OR**
- Give reasons why sewage required to be pumped?
14. What is sewage sickness and how it can be prevented? (5)
- OR**
- What are the criteria required for materials used for pipe sewers?
15. What are different type of Sewage Appurtenance and explain in details? (10)
- OR**
- Discuss in details various physical tests of sewage.
16. Fill in the Blanks : (5×1=5)
- (i) As per IS:456-2000 the maximum tension reinforcement shall not exceed _____. (where, D= overall depth of beam, b=breadth of beam).
 - (ii) Landfill in which single type of waste is placed i.e construction waste are designated as _____
 - (iii) Stripping time for vertical form work to columns, walls, beams is _____
 - (iv) The modulus of elasticity of steel shall be taken as _____
 - (v) Concrete in sea water or exposed directly along the sea coast shall be at least _____ grade for reinforced concrete.