

MIZORAM PUBLIC SERVICE COMMISSION

**DEPARTMENTAL EXAMINATIONS FOR JUNIOR GRADE OF M.E.S. (AE/SDO)
UNDER IRRIGATION & WATER RESOURCES 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. What is the difference between F and w-index? (5)
2. How is consistency of rainfall record at a station tested? How does inconsistency in record arise? (5)
3. Discuss the different forms of precipitation and write brief note about them. (5)
4. What is Hydraulic and Hydrological routing of flood and give at least two examples for each? (5)
5. The flood record for a period of 25 years of a small tributary of a main river has been analyzed based on the assumption that the distribution is log-normal. The mean 'm' and standard deviation 's' of distribution have been found to be $2.5\text{m}^3/\text{s}$ and $1.0\text{m}^3/\text{s}$ respectively. Find the magnitude of 100 yr and 1000 yr return period. (5)
6. Explain 'Liquidity Index', 'Activity number', 'Thixotropy' and 'Sensitivity' of soil. (5)
7. What is 'index properties of soil'? List the properties under different categories? (5)
8. Write the assumptions made in deriving equation for discharge in aquifer (five points). (5)
9. A deposit of fine sand has porosity of 45%. Estimate the hydraulic gradient to develop quicksand condition if the specific gravity of grain is 2.7. (5)
10. (a) A flow net is plotted for a homogeneous earthen dam of 30.0 m height with a free board of 5.0 m. If $k = 6 \times 10^{-4}\text{ cm/sec}$, Number of flow channels = 4, Number of potential drops = 10, calculate the discharge per meter run of dam. (3)
(b) Estimate the value of coefficient of permeability for uniform graded sand of size $D_{10} = 0.15\text{ mm}$ obtained from sieve analysis. $G = 2.67$ (Hint: use Allen Hazen's equation) (2)

PART – B (50 MARKS)

11. (a) Define Systematic Error and Accidental Error. (2)

(b) The distance between two stations was measured with 20m chain and found to be 2500m. The same was measured with 30m chain and found to be 2460m. If 20m chain was 5cm too short what was error in the 30m chain? (3)

12. A closed traverse has the following lengths and bearings: (5)

Line	Length (m)	Bearings
AB	200.00	Roughly East
BC	98.00	178°
CD	Not obtained	270°
DA	86.40	1°

The length CD could not be measured due to some obstruction in chaining. The bearing of AB could not be taken as station A was badly affected by local attraction. Find the length of CD and exact bearing of side AB.

13. Describe the characteristics of contours (five points). (5)

14. A line AB measures 10 cm on a photograph taken with a camera having a focal length of 22 cm. the same line measures 4 cm on a map drawn to a scale of 1/140000. Calculate the flying height of the aircraft, if the average altitude is 400 m. (5)

15. Explain remote sensing method of surveying. List the various uses of remote sensing data (three points). (5)

16. Write the difference between CPM and PERT in network analysis (five points). (5)

17. A project is expected to take 20 months along the critical path having a standard deviation of 2.5 months. What is the probability of completing the project within (a) 20 months, (b) 25 months and (c) 17.5 months? The probability percentages for different values of probability factor are: 15.87% for -1; 50% for 0; 97.72% for +2. (5)

18. Define ‘optimistic time estimate’, ‘pessimistic time estimate’ and ‘most likely time estimate’. (5)

19. Explain ‘Resource Smoothing’ and ‘Resource leveling’. (5)

20. Write a brief note on: (5)

- (a) Beta Distribution on PERT
- (b) EPC Contract.