MIZORAM PUBLIC SERVICE COMMISSION

GENERAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO THE POST OF JUNIOR GRADE OF MIZORAM FOREST SERVICE i.e. ASSISTANT CONSERVATION OF FOREST (ACF) UNDER ENVIRONMENT, FOREST & CLIMATE CHANGE DEPARTMENT, GOVERNMENT OF MIZORAM, 2018

CIVIL ENGINEERING

Time Allowed : 3 hours   Full Marks : 100

*The figures in the margin indicate
full marks for the questions.*

*Answer any 10 (ten) questions
taking 5 (five) questions from each section.*

SECTION - A

1. (a) Define the term   **(2×3=6)**
    (i) Floor area
    (ii) Bulk materials
    (iii) Plinth area

    (b) Explain the various steps involves in preparation of detailed project report for a reinforced concrete dam.   **(4)**

2. (a) Write down the difference between statically determinate and statically indeterminate structure?   **(4)**

    (b) Draw bending moment diagram (BMD) and shear force diagram (SFD) for udl as shown below   **(6)**
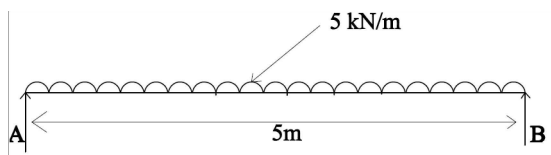
3. (a) What are the assumptions made in the theory of bending as applied to reinforced concrete?   **(5)**

    (b) What do you understand by under-reinforced and over-reinforced sections?   **(5)**

4. (a) What are the various modes of failure for a riveted joint?   **(4)**

    (b) A double riveted double cover butt joint in plates 16 mm thick is made with 20 mm rivets at 80 mm pitch. Calculate the pull per pitch length at which the joint will fail and also its efficiency. Take f_t=480 N/mm², f_b = 760 N/mm² and f_s=380 N/mm².   **(6)**

    * f_t = *ultimate tensile strength of the plate material*

    f_b = *ultimate crushing strength of rivet material*

    f_s = *ultimate shear strength of rivet material*

5. Determine the moment of resistance of a singly reinforced beam 160 mm wide and 300 mm deep to the centre of reinforcement, if the stresses in steel and concrete are not to exceed 140 N/mm^2 and 5 N/mm^2. The reinforcement consists of 4 bars of 16 mm diameter. Take m=18. If the above beam is used over an effective span of 5 m. Find the maximum load the beam can carry, inclusive of its own weight. **(10)**

6. (a) Explain the principle of post- tensioning. **(5)**

   (b) Define the term mineral admixture. Write down the pozzolanic reaction in concrete when mineral admixtures are used. **(2+3=5)**

7. (a) For a particular activity of a project, time estimates received from two engineers X and Y are as follows:

	Optimistic Time	Most Likely	Time Pessimistic Time
Engineer X	4	6	8
Engineer Y	3	5	8

   State who is more certain about the time of completion of the job. **(5)**

   (b) PERT calculations yield a project length of 50 weeks, with a variance of 16. Within how many weeks would you expect the project to be completed with probability of 95% and 40% respectively? **(5)**

SECTION - B

8. (a) One litre crude oil weighs 9.6 N. Calculate its specific weight, density and specific gravity. **(5)**

   (b) State Bernoulli's theorem. Mention the assumptions made. How is it modified while applying in practice? **(5)**

9. (a) Explain the hydrological cycle. **(4)**

   (b) A tube well of 50 cm diameter penetrates fully in an artesian aquifer. The strainer length is 15 m, calculate the yield from the well under a drawdown of 3m. The aquifer consists of sand of effective size of 0.2mm having coefficient of permeability equal to 50m/day. Assume radius of drawdown equal to 150 metres. **(6)**

10. (a) Explain various processes involved in sludge treatment and disposal. **(5)**

   (b) Define water-born Diseases. Write down the classification of water-born Diseases. **(5)**

11. A sample of clay taken from a natural stratum was found to be partially saturated and when tested in the laboratory gave the following results. Specific gravity of soil particles is 2.69, wet weight of sample is 255g, dry weight of sample is 210g and volume of sample is 150cm^3. Compute the degree of saturation, water content, porosity and void ratio. **(10)**

12. (a) Describe the procedure to conduct grain size analysis test and explain how to distinguish well graded and poorly graded soil. **(6)**

   (b) What are the properties of the flow nets. **(4)**

13. What is the main difference between plane surveying and geodetic surveying? Explain in brief atleast 3 instruments used for plane surveying. **(4+6=10)**

14. (a) Explain over-taking sight distance. **(4)**

   (b) What are the different types of bituminous materials used in road construction? Under what circumstances each of these materials is prepared. **(3+3=6)**

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