MIZORAM PUBLIC SERVICE COMMISSION

DEPARTMENTAL EXAMINATIONS FOR JUNIOR GRADE OF M.E.S. (AE/SDO) UNDER PUBLIC WORKS DEPARTMENT, SEPTEMBER, 2018.

CIVIL ENGINEERING PAPER – I

Time Allowed : 3 hours FM : 100 PM : 40

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

1. State the following: **(5×3=15)**

(a) Active Earth Pressure

(b) Passive Earth Pressure

(c) Earth Pressure at rest

(d) Assumptions upon which Rankine's Theory is based

(e) Compaction and Consolidation of soil mass.

2. State various types of foundation. **(5)**

3. Design a footing for a square column of 400mmx400mm carrying a load of 1000 KN. the bearing capacity of the soil is 200 KN/sqm take c=5N/mm^2, t = 140N/mm^2 and m=18. **(10)**

4. Give General Equation for safe Bearing Capacity of C-ϕSoil using the following symbols: **(5)**

q_s = safe bearing capacity; F = Factor of safety

s'= effective overburden pressure at the footing level with due regards to submergence.

s = Total over burden pressure (γD) at footing level.

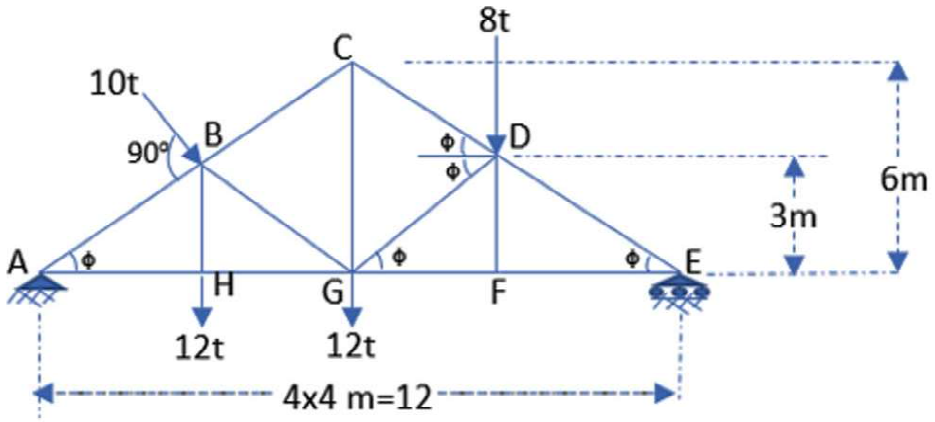
N_c, N_q, N_r = Terzaghi's bearing capacity factors

γ = Density of soil in Kg or tonnes/m^3

B = width of footing in metres.

c' = cohesion kg or tonnes/m^2

5. Fine the Vertical Support Reactions at A & B and Horizontal component reaction at A for the given symmetrical pin jointed truss and loading as shown in the following fig. by any method. **(10)**



6. What are the advantages of R.C.C. and Steel structures? **(5+5=10)**

7. Design a short R.C. column required to carry an axial load of 1500 KN. Use m 20 grade of concrete (i.e. $\sigma_{cc} = 5$ N/mm^2) and mild steel reinforcement (i.e. $\sigma_{sc} = 130$ N/mm^2) **(10)**

8. Draw typical section of Masonry Retaining wall having an effective height of 5.0m. **(10)**

9. Enumerate the various types of water demands in cities, and what is meant by Domestic water demand? **(7+3=10)**

10. Drawing typical plan, L-section of Septic Tank having length=2.5m; width=1.2m and depth=1.2m. **(5)**

11. Select the correct answer: **(5×2=10)**

(a) IS 456-2000 expresses the Modulus of elasticity of concrete

(i) $E_C = 0.7\sqrt{(fck)}$ (ii) $E_C = 1000\sqrt{(fck)}$

(iii) $E_C = 2000\sqrt{(fck)}$ (iv) $E_C = 5000\sqrt{(fck)}$

(b) The value of flexural strength of M25 concrete is

(i) 4.0 MPa (ii) 3.5 MPa

(iii) 3.0 MPa (iv) 2.5 MPa

(c) A beam is said to be balance section when

(i) no compressive reinforcement is required to provide

(ii) both tension and compression steel are required to provide

(iii) when the live and dead loads of the beam do not cause failure to the beam

(iv) when only compressive reinforcement is need to be provided

(d) Which is the most common cause of acidity in water?

(i) Carbon monoxide (ii) Nitrogen

(iii) Hydrogen (iv) Carbon Dioxide

(e) The various treatment processes in a water treatment plant are listed below.

1. Filtration
2. Chlorination
3. Sedimentation
4. Coagulation
5. Flocculation

The correct sequence of these processes in water treatment is

(i) 1, 2, 3, 4, 5 (ii) 4, 5, 3, 1, 2

(iii) 2, 3, 1, 5, 4 (iv) 1, 2, 5, 3, 4

* * * * * * *