

# MIZORAM PUBLIC SERVICE COMMISSION

## DEPARTMENTAL EXAMINATIONS FOR JUNIOR GRADE OF M.E.S. (AE/SDO) UNDER PUBLIC WORKS DEPARTMENT, GOVERNMENT OF MIZORAM, DECEMBER, 2019.

### CIVIL ENGINEERING PAPER – I

Time Allowed : 3 hours

FM : 100 PM : 40

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

#### PART - I

**Direction (Questions No. 1 - 10) : Choose the correct answer from the followings. (10×2=20)**

- The design for ductility in special moment resisting frame (SMRF) will lead to an increase in :-
  - Main steel
  - Transverse steel
  - Vertical steel
  - None of these
- Unless treated appropriately, the steel grade for reinforcement recommended by IS13920:1993 is :-
  - Fe 415 or less
  - Fe 500
  - Fe 550
  - All of these
- The thickness of any part of shear wall as per IS 13920 : 1993 shall not preferably be less than :-
  - 100 mm
  - 120 mm
  - 150 mm
  - 200 mm
- Using the usual notations, for ductile reinforcement, the vertical reinforcement ratio across a horizontal construction joint shall not be less than :-
  - $0.80/f_y (\tau_v - P_u/A_g)$
  - $0.80/\tau_v (f_y - P_u/A_g)$
  - $0.92/f_y (\tau_v - P_u/A_g)$
  - $0.92/\tau_v (f_y - P_u/A_g)$
- Presence of excessive amount of which of the following can cause expansion and disruption of concrete:-
  - Silica
  - Nitrate
  - Chlorides
  - Sulphates
- The member, which would have the shortest minimum stripping time of formwork among the followings is :-
  - Soffit of slab
  - soffit of Beams
  - Vertical face of columns
  - Props to slab spanning up to 4
- Sieve size of  $75\mu$  corresponds to :-
  - 0.00075 mm
  - 0.0075 mm
  - 0.075 mm
  - 0.75 mm

8. The angle of friction or angle of repose ( $\varphi$ ) of a soil sample depends on :-
- (a) Size of the particle
  - (b) shape of the particle
  - (c) Compaction
  - (d) Plastic limit of the sample
9. The lateral earth pressure behind a Retaining wall is maximum when the state of stress of the soil behind the wall is in :-
- (a) Neutral
  - (b) Tension
  - (c) Compression
  - (d) None of these
10. All structures required to retain liquids should be designed for :-
- (a) Empty condition
  - (b) Full condition
  - (c) Partially full condition
  - (d) Both (a) & (b)

**Direction (Questions No. 11 - 18) : Attempt only 6 (six) questions.**

**(6×5=30)**

11. (a) What are the requirements for layout of Housing Drainage?  
(b) Explain One-Pipe system and Two-Pipe system of plumbing in Building.
12. Explain the followings in connection with Sanitary installations in Building :-
- (a) Anti-siphon Pipe
  - (b) Ball Cock
  - (c) Bip Tap
  - (d) Soil Pipe
  - (e) Spigot and Socket joint
13. (a) What are the main gases produced in Septic Tank due to Anaerobic digestion?  
(b) Explain the construction and function of Soak Pit.
14. (a) How is the seating error avoided in a Standard Penetration Test (SPT)?  
(b) Explain the corrections applied to the N-values of SPT.
15. (a) What is the minimum depth upto which bore holes should be sunk in sub-soil investigation for any type of foundations?  
(b) Explain how the type of foundation namely, Pad foundation, large Raft foundations, closely spaced Pad foundation and Pile foundation affects the depth of bore hole to be sunk.
16. In compaction process of soil, explain :-
- (a) the effect of compactive effort on dry density
  - (b) the effect of moisture content on dry density
  - (c) the effect of compactive effort on moisture content
17. (a) Explain Thermo-mechanically Teated (TMT) bars. What are the advantages of TMT bars?  
(b) Discuss use of cement grade 33 and 53 in construction.
18. (a) What is efficiency of Rivet Joints? How can efficiency be maximized at the weakest critical section?  
(b) Explain with diagram Lacings and Battening for Built-up steel compression members.

**PART - II**

**Direction (Questions No. 19 - 28) : Choose the correct answer from the followings. (10×2=20)**

19. The relationship between the Bulk modulus, Modulus of Elasticity and Poisson's ratio is given by  $K = E/3(1 - 2\mu)$ . The limiting value of Poisson's ratio would be :-  
(a)  $> 0.5$  (b)  $\leq 0.5$   
(c)  $> 1$  (d)  $\leq 1$
20. The stress primarily responsible for failure of Brittle material is :-  
(a) Normal stress (b) Shear stress  
(c) Bearing stress (d) None of these
21. The primary stress when a material is subjected to torsion is :-  
(a) Bending stress (b) Bearing stress  
(c) Normal stress (d) Shear stress
22. The critical stress for pin-ended column is given as  $\sigma_{cr} = \pi^2 E / (L/r)^2$ . If this value is greater than yield stress of structural steel, the column will :-  
(a) buckle but remain elastic  
(b) yield in compression but remain elastic  
(c) buckle and then yield in compression  
(d) yield in compression and cease to be elastic before it has a chance to buckle.
23. Which of the following items of work would be under special repair in Building maintenance:-  
(a) Replacement of blown fuses (b) Repair/Replacement of flooring  
(c) Removal of choked drainage pipes (d) Patch repair to plaster
24. The percentage deduction to be made for payment of excavation other than rock from stacked volume as per MoRTH specifications for Road & Bridges is :-  
(a) 10% (b) 13%  
(c) 16% (d) 35%
25. Quality of products and services is determined by :-  
(a) Engineer (b) Market  
(c) Management (d) Customer
26. The CPWD specifications recommendation for frequency of testing for gradation of aggregates in laboratory or field for Bituminous Macadam work is :-  
(a) 1 test per 100 cum (b) 2 tests per 250 cum  
(c) 1 test per 50-100 cum (d) 2 tests per day per plant
27. Which of the following is an example of Endogenous trees?  
(a) Mahogany (b) Bamboo  
(c) Pine (d) Teak

28. If sandstone sample fails in Acid test by broken edges and formation of powder on the surface, it indicates presence of :-
- (a) Calcium carbonate
  - (b) Calcium chloride
  - (c) Calcium bi-carbonate
  - (d) Calcium hydroxide

**Direction (Questions No. 29 - 36) : Attempt only 6 (six) questions.**

**(6×5=30)**

29. (a) Define Elastic section modulus of an Engineering material.  
(b) Discuss use of wooden beam having a square cross-section and of Rectangular Cross-section, both having the same cross-sectional area.
30. (a) Give reason to why failure surfaces of ductile material form an angle of  $45^\circ$  with the load.  
(b) Discuss use of high strength steel in a given structure of identical conditions from stiffness and load carrying capacity point of view.
31. (a) Explain preventive maintenance in Buildings.  
(b) How accessibility for maintenance of high-rise building may be taken care of to avoid maintenance problems in future.
32. (a) List any six (6) commonly used equipment in erection of steel structure.  
(b) Discuss the suitability of steel structure in Mizoram.
33. (a) Define cost index and schedule of rates.  
(b) What are the drawbacks of cost index?
34. In foundation of a building, the thickness of foundation concrete is 0.6m. If the depth of excavation is 1.5m and the quantity of earthwork in excavation of foundation is 2.16 Cum. Estimate the quantity of foundation concrete.
35. (a) Define Pigment Volume concentration number (PVCN) in paints.  
(b) Discuss how painting should be done for Galvanised Iron works.
36. (a) What are the characteristics of an ideal damp proofing materials?  
(b) Name any five (5) commonly used Damp proofing material.

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