

# MIZORAM PUBLIC SERVICE COMMISSION

## DEPARTMENTAL EXAMINATION FOR JUNIOR GRADE OF M.E.S. (AE/SDO) UNDER IRRIGATION & WATER RESOURCES DEPARTMENT, GOVERNMENT OF MIZORAM. (JULY-2025)

### ENGINEERING PAPER – I (Common for Civil & Agriculture Engineers)

Time Allowed : 3 hours

FM : 100 PM : 40

#### **SECTION - A (Multiple Choice Questions) (50 Marks)**

*All questions carry equal mark of 1 each. Attempt all questions.*

*This Section should be answered only on the **OMR Response Sheet** provided.*

1. The efficiency of a centrifugal pump is maximum when its blades are:  
(a) bent forward (b) bent backward  
(c) bent forward first and then backward (d) bent backward first and then forward
2. The centrifugal pump is started with its delivery valve  
(a) kept fully closed (b) kept fully open  
(c) irrespective of any position (d) kept 50% open
3. The advantage of a double-acting reciprocating pump over a single-acting pump is  
(a) gives clean water (b) gives uniform discharge  
(c) consumes more power (d) it has less friction loss
4. In well hydraulics, what condition is assumed for steady flow?  
(a) Constant discharge (b) Constant water level  
(c) Constant pump pressure (d) Constant temperature
5. What parameter is measured during a well yield test?  
(a) Pump efficiency (b) Water quality  
(c) Water table depth (d) Discharge rate
6. The construction of drain is always started at the -  
(a) outlet and progress upstream (b) upstream and progress at the outlet  
(c) last contour of field (d) first contour of field
7. In a submerged orifice flow, the head of water on one side is  $H_1$  and the other side is  $H_2$ . The discharge through the orifice is proportional to:  
(a)  $H_1 - H_2$  (b)  $H_1^{1/2} + H_2^{1/2}$   
(c)  $(H_1/H_2)^{1/2}$  (d)  $(H_1 - H_2)^{1/2}$

8. The horizontal to vertical side slope of Cipoletti weir is –
- (a) 1:1 (b) 1:3  
(c) 1:2 (d) 1:4
9. In a gravity-fed irrigation pipe system, what should be the minimum slope to ensure self-cleaning velocity?
- (a) 1 in 10 (b) 1 in 1000  
(c) 1 in 500 (d) 1 in 100
10. What happens if the water downstream of the weir submerges the crest?
- (a) Flow measurement becomes more accurate  
(b) Flow over the weir increases  
(c) The weir still functions correctly  
(d) The accuracy of the flow measurement decreases
11. Which one of the following is true for the most economical trapezoidal section?
- (a) Half of the base width = one of the sloping side  
(b) Half of the sloping side = total base width  
(c) Half of top width = One of the sloping sides  
(d) Total top width = one of the sloping sides
12. Which of the following is the correct formula for Gross irrigation requirement?
- (a)  $C_u - R_e$  (b) CIR + leaching losses  
(c)  $NIR/N_a$  (d)  $FIR/N_c$
13. If wheat requires about 7.5 cm of water after every 28 days , and the base period for wheat is 140 days , then delta of wheat is:
- (a) 37.5 (b) 45  
(c) 38 (d) 50
14. Determine the distribution efficiency, if the depths of water in the field are 1.1 cm and 1.8 cm.
- (a) 80% (b) 90%  
(c) 85% (d) 75%
15. Why should the H/L ratio be kept below 0.33 in a sharp-crested weir?
- (a) To ensure submerged flow (b) To minimize sedimentation  
(c) To maintain free, uninhibited nappe flow (d) To increase turbulence
16. The monthly consumptive use values for paddy are 26.69, 8.76, 14.38, 22.73, 21.29, 25.50 and 15.06 for the duration of month from June to July. What is the average daily consumptive use?
- (a) 7.0 mm (b) 8.0 mm  
(c) 7.5 mm (d) 8.5 mm
17. What is the safe limiting velocity for cement concrete lining?
- (a) 1.5 m/s (b) 2.2 m/s  
(c) 2.7 m/s (d) 1.8 m/s
18. Recommended safe limits of land slopes for sandy loam to sandy soil is:
- (a) 0.25% to 0.60% (b) 0.20% to 0.40%  
(c) 0.05% to 0.20% (d) 0.10% to 0.20%

19. The most economical type of lining is the one that shows \_\_\_\_\_
- (a) minimum benefit-cost ratio
  - (b) maximum benefit-cost ratio
  - (c) zero benefit-cost ratio
  - (d) benefit-cost ratio = 1
20. Which method is widely used in India for the computation of consumptive use?
- (a) Penman's equation
  - (b) Hargreaves – Christiansen equation
  - (c) Blaney-Criddle equation
  - (d) Tanks and lysimeter
21. Which loss occurs due to sudden enlargement or contraction in irrigation pipes?
- (a) Friction loss
  - (b) Velocity head loss
  - (c) Minor (local) head loss
  - (d) Static head loss
22. Which type of moisture acts as a bridge between soil moisture content and field capacity?
- (a) Equivalent moisture
  - (b) Soil moisture deficiency
  - (c) Available moisture
  - (d) Readily available moisture
23. What is relay cropping in agriculture?
- (a) Planting a second crop before the first crop is harvested
  - (b) Planting multiple crops in the same field at the same time
  - (c) Rotating crops over a fixed period
  - (d) Growing different crops on separate plots in the same field
24. What does the term “exit gradient” refer to in seepage analysis of weirs?
- (a) The slope of the downstream bed
  - (b) The gradient of flow inside the weir
  - (c) The hydraulic gradient at the downstream end of the seepage path
  - (d) The slope of the water surface
25. In the case of weirs on permeable foundations, the downstream pile is provided
- (a) To reduce the uplift pressure on floor
  - (b) To prevent undermining
  - (c) To reduce uplift pressure & prevent undermining
  - (d) To increase the vertical creep
26. The compressive strength of paving bricks should not be less than
- (a) 20 MN/m<sup>2</sup>
  - (b) 30 MN/m<sup>2</sup>
  - (c) 40 MN/m<sup>2</sup>
  - (d) 50 MN/m<sup>2</sup>
27. The partial safety factor for live load is generally taken as:
- (a) 1.2
  - (b) 1.3
  - (c) 1.5
  - (d) 1.7
28. In column design using LSM, the interaction curve represents:
- (a) Axial load vs. deflection
  - (b) Axial load vs. bending moment capacity
  - (c) Moment vs. curvature
  - (d) Load vs. displacement
29. The relationship between Young's modulus (E), Bulk Modulus (K) and Poisson's ratio ( $\mu$ ) is given by
- (a)  $E = 3 K (1 - \mu)$
  - (b)  $E = 3 K (1 - 2\mu)$
  - (c)  $K = 3 E (1 - 2\mu)$
  - (d)  $K = 3 E (1 - \mu)$

30. Which of the following IS Codes is relevant to WSM design of RCC?
- (a) IS 456-2000 (b) IS 875 Part 1  
(c) IS 800 (d) IS 1893
31. The highest stress that a material can withstand for a specified length of time without excessive deformation is called
- (a) Fatigue strength (b) Endurance strength  
(c) Creep strength (d) Rupture strength
32. The bulking of sand is maximum at a moisture content of:
- (a) 2–3% (b) 4–6%  
(c) 8–10% (d) 12–15%
33. The carbon content in mild steel is about:
- (a) 0.05–0.25% (b) 0.25–0.60%  
(c) 0.6–1.5% (d) 1.5–2%
34. The type of lime used for whitewashing is:
- (a) Quick lime (b) Hydraulic lime  
(c) Fat lime (d) Dolomitic lime
35. The property of steel which allows it to be drawn into wires is:
- (a) Malleability (b) Ductility  
(c) Toughness (d) Elasticity
36. In Working Stress Method, stress distribution in concrete is assumed to be:
- (a) Parabolic (b) Trapezoidal  
(c) Linear (d) Non-linear
37. A fenced area of land with wire gauze, divided into sections with forage crops is called
- (a) Production structure (b) Paddock  
(c) Forage area (d) Pasture ground
38. What is the recommended floor space per adult cow in a cattle shed?
- (a) 40 sq ft. (b) 65-70 sq ft.  
(c) 100 sq ft. (d) 150 sq ft.
39. Pick up the item of work not included in the plinth area estimate from the following :
- (a) Wall thickness (b) Verandah area  
(c) Room area (d) Courtyard area
40. Using plinth area method, estimate the construction cost of a building having plinth area of 15m<sup>2</sup>, if the plinth area rate is Rs. 2000/- per m<sup>2</sup>
- (a) Rs. 25,000.00 (b) Rs. 20,000.00  
(c) Rs. 30,000.00 (d) Rs. 15,000.00
41. Which of the following estimates mostly resembles a detailed estimate?
- (a) Item rate estimate (b) Rough estimate  
(c) Annual maintenance estimate (d) Quantity estimate

42. For 2.5 cm thick c.c. floor of 1:2:4 proportion, for 100 sq m, how many cement bags will be required?
- (a) 18 (b) 28  
(c) 24 (d) 10
43. The contingency cost in an estimate accounts for:
- (a) The expected cost overrun due to unforeseen circumstances  
(b) Extra cost of special labor  
(c) Cost of demolition and disposal  
(d) Cost of transportation
44. The volume of cut earthwork will be positive when:
- (a) The excavation level is above the existing ground level  
(b) The excavation level is below the existing ground level  
(c) The fill material is in excess  
(d) The ground level is higher than the excavated level
45. In estimating the volume of cut and fill, the shrinkage factor is used to:
- (a) Adjust the volume of excavated material due to moisture loss during transport  
(b) Account for the volume reduction during compaction of fill material  
(c) Estimate the cost of labor for material movement  
(d) All of the above
46. Which of the following is the function of the transverse reinforcement in a column?
- (a) To prevent longitudinal buckling of longitudinal reinforcement  
(b) To prevent certain brittle failure  
(c) To impart certain ductility to the column  
(d) To reduce effect of creep
47. In RCC members if a beam is over-reinforced and loaded up to destruction, the failure will occur due to:
- (a) Buckling (b) Cracks  
(c) Shrinkage of concrete (d) Crushing of concrete
48. A beam which is simply supported at both ends carries a uniform load of 1.5kN/m. The span is of 6m and the diameter is 75mm. Find the value of maximum bending moment.
- (a) 9 kNm (b) 5kNm  
(c) 3.75kNm (d) 6.75kNm
49. Which of the following property is true for brittle material?
- (a) Plastic Nature (b) Elastic Nature  
(c) Homogenous (d) Conductors
50. The concrete in the \_\_\_\_\_ zone should not be considered while determining the neutral axis.
- (a) Compression (b) Neutral Zone  
(c) Centroidal Zone (d) Tension Zone

**SECTION- B (Conventional Type) (50 Marks)**

*This Section should be answered only on the **Answer Sheet** provided.*

*Marks for each question is indicated against it.*

1. What is priming of a centrifugal pump? Explain why priming is essential before starting a centrifugal pump? (3)
2. Why is it important to maintain a balance in sediment transport within irrigation canals? Explain the hydraulic principles involved. (3)
3. Define irrigation scheduling. What are the key criteria for effective irrigation scheduling? (3)
4. What are the main causes of weir failures on permeable foundations, and what remedies would you suggest to prevent them? (3)
5. What is a pumping test? State the purpose of conducting a pumping test. (3)
6. Design the most economical trapezoidal section of a channel to carry a discharge of  $10\text{m}^3/\text{s}$  in a bed slope of 1 in 3000. For stability, the side slope is 1.5:1 and the value of Manning's  $n$  is 0.025. (5)
7. Indicate the various components of a diversion headwork and briefly explain the function of each component. (5)
8. Explain acid test with its significance for building stones. (3)
9. Explain the essential field test required for cement. (3)
10. Differentiate between Working Stress Method and Limit State Method. (3)
11. State any four essential features of a good cowshed and explain their significance in dairy farm management. (3)
12. What is Rate Analysis? What are the costs to be considered to reach a Rate of concrete per cum? (3)
13. Explain the procedure for measurement of earthwork mixed with soil, ordinary rocks and hard rocks in surface excavation where the ground is not uniform or where the site is required to be levelled. (5)
14. A distributary canal is to be constructed with the following cross-section: (5)  
*Bed width (B): 3 m Depth of flow (D): 1.5 m Side slopes: 1.5 horizontal : 1 vertical*  
*Length of canal: 500 m*

Calculate the quantity of earthwork excavation required for the canal.