# MIZORAM PUBLIC SERVICE COMMISSION

## DEPARTMENTAL EXAMINATIONS FOR JUNIOR ENGINEER UNDER POWER & ELECTRICITY DEPARTMENT, GOVERNMENT OF MIZORAM, JUNE-2024.

## CIVIL ENGINEERING PAPER

Time Allowed : 3 hours FM : 100 PM : 40

*Marks for each question is indicated against it.*
*Scientific calculator is allowed. Attempt all questions.*

### PART 'A' (50 MARKS)

**1.** Workout the estimated cost for PCC floor (1:2:4) from the following given data: **(10)**

(i) Length = 12.00m. (ii) Breadth = 8.00m.
(iii) Height/Thickness = 0.10m. (iv) Rate Rs. 8,000.00/$m^3$.
(v) Cost Index = 20.00%.

**2.** Explain the following terms: **(2×5=10)**

(i) Super elevation (ii) Camber

**3.** Choose the correct answer from the following options: **(10×1=10)**

(i) Moisture absorption of a good stone should be less than:
(a) 1% (b) 5%
(c) 8%

(ii) The main purpose of seasoning of timber is to:
(a) reduce moisture content (b) make it fire resistant
(c) make it waterproof

(iii) The standard size of bricks as per Indian Standards is:
(a) 230 × 120 × 80 mm (b) 190 × 90 × 90 mm
(c) 190 × 100 × 100 mm

(iv) The minimum strength of brick required for building wall is:
(a) 7.5 $N/mm^2$ (b) 5.0 $N/mm^2$
(c) 3.5 $N/mm^2$

(v) For testing compressive strength of cement, the size of cubes used is:
(a) 50 mm (b) 70.6 mm
(c) 100 mm

(vi) The aggregate is called coarse aggregate if it is completely retained on:
(a) 12 mm sieve (b) 8 mm sieve
(c) 4.75 mm sieve

(vii) Which one of the following is not a desirable property of sand?
(a) It should be chemically active (b) It should contain sharp, angular grains
(c) It should be hard

(viii) The weight and volume of one bag of cement respectively are:

(a) 50 kg and 35 litres (b) 60 kg and 30 litres

(c) 50 kg and 30 litres

(ix) Compaction of concrete is to:

(a) remove entrapped air (b) spread cement paste uniformly

(c) get level surface at top

(x) Slump required for concreting lightly reinforced sections without vibration is:

(a) up to 25 mm (b) 25 – 75 mm

(c) 25 – 100 mm

**4.** Fill up the blank with the given options of answers. **(10×1=10)**

(i) Field test for strength of good bricks is to drop it from a height of _____ and they should not break. (1.0 m/1.5 m/2.0 m).

(ii) The cement to dry sand proportion recommended for plastering concrete surface is _____. (1:4/1:3/1:5)

(iii) The survey in which earth's curvature is considered is called _____ (Plane Surveying/ Geodetic Surveying/Topographic surveying)

(iv) The survey in which earth's curvature is neglected is called _____. (Plane Surveying/ Geodetic Surveying/Topographic surveying)

(v) Number of standard bricks required for 1 $m^3$ of masonry is _____. (700/600/500)

(vi) In preliminary survey of a road project in hilly region, cross sections are taken generally at _____. (30 m/40 m/50 m)

(vii) When a vehicle traces a horizontal curve, it is subjected to centrifugal force in _____ direction. (inward/outward/forward)

(viii) The process of maintaining satisfactory moisture and temperature in a freshly laid concrete is called _____. (bonding/curing/pointing)

(ix) If the water cement ratio to be used is 0.5, then water to be added to one bag of cement is _____ . (25 kg/30 kg/40 kg)

(x) Concrete should not be placed by dropping at a height more than _____ . (900 mm/ 800 mm/700 mm)

**5.** State whether the following statements are **True** or **False.** **(10×1=10)**

(i) The ratio of tensile strength to compressive strength of steel is less than 1.

(ii) The process of giving required shape and size to stones is known as dressing.

(iii) A stone with crushing strength more than 100 N/mm2 is treated as good stone.

(iv) The sequence of survey in a road project is - topographic, reconnaissance, preliminary and detailed.

(v) Curing of concrete is the process of covering the surface with wet gunny bags.

(vi) The ratio of strength of concrete after 1 year to that at 28 days is 1.2.

(vii) Stain appears in wood due to poor ventilation during storage.

(viii) Bond length can be reduced by increasing the perimeter of steel bar surrounding the concrete.

(ix) The brick is considered dry when the moisture content is 2%.

(x) The minimum initial setting time of cement should be 40 minutes.

## PART 'B' (50 MARKS)

**6.** Draw the general layout of Small Hydel Project from the following given components: **(10)**

(i) Diversion Weir
(ii) Power House
(iii) Forebay
(iv) Penstock
(v) Switchyard
(vi) Power Channel and
(vii) Desilting Tank

**7.** Write down the four methods for measuring water discharge of a river and explain any two in details. **(4+6=10)**

**8.** Choose the correct answer from the following options: **(10×1=10)**

(i) The head in a Small Hydel Projects is:
  (a) The head is the vertical distance that water rises
  (b) The head is the horizontal distance that water falls
  (c) The head is the vertical distance that water falls

(ii) Which of the following is not a requirement for site selection of Small Hydel Project?
  (a) Availability of water
  (b) Large catchment area
  (c) Sedimentation

(iii) The amount of electrical energy that can be generated at Small Hydel Project depends upon:
  (a) Head of water
  (b) Quantity of water
  (c) Efficiency of Alternator

(iv) The power plant of Small Hydel Project is:
  (a) Non-renewable source of energy
  (b) Conventional source of energy
  (c) Non-conventional source of energy

(v) The contour interval for diversion structure of Small Hydel Project is:
  (a) 2 m
  (b) 3 m
  (c) 4 m

(vi) The depth of water for which a hydroelectric generator and turbines are designed:
  (a) Gross head
  (b) Net head
  (c) Rated head

(vii) The storage of water below the bottom of the lowest sluice way in a reservoir is:
  (a) Dead storage
  (b) Surcharge storage
  (c) Live storage

(viii) The notches are devices for measuring small discharges of the order of:
  (a) 0.40 $m^3$/sec – 0.50 $m^3$/sec
  (b) 0.60 $m^3$/sec. – 0.70 $m^3$/sec
  (c) 0.03 $m^3$/sec. – 0.30 $m^3$/sec

(ix) The contour interval for general layout of Small Hydel Project is:
  (a) 10 m
  (b) 5 m
  (c) 2 m.

(x) Small Hydel Project is mainly located in.
  (a) Flat areas
  (b) Deserts
  (c) Hilly areas

**9.** Fill up the blank with the given options of answers. **(10×1=10)**

(i) The difference in height of the water level between the level in storage and tailrace is called _____. (Net head/Gross head/Rated head)

(ii) _____ is a switching station which is the main link between the generating plant and the transmission system. (Switchyard/Power House/Turbine)

(iii) _____ are open or closed conduits that carry water to the turbines. (Power channel/ Penstock/Desilting Tank)

(iv) _____ are open or closed conduits that carry water to the Forebay. (Power channel/ Penstock/Desilting Tank)

(v) _____ is used to measure velocity at a point in the flow cross-section. (V-notch/ Current meter/Rectangular notch)

(vi) The volume of water level stored between the full reservoir level and minimum pool level is called _____.(live storage/dead storage/reservoir)

(vii) The net amount of power which is continuously available from a plant is called _____ (firm power/secondary power/installed capacity)

(viii) The maximum power which can be developed by generators at normal head with full flow is called _____ (load factor/installed capacity/peak load)

(ix) The ratio of average generation of the plant to the plant installed capacity is called _____. (average load/peak load/load factor)

(x) The excess power available over the firm power during the off peak hours is called _____. (firm power/secondary power/installed capacity)

**10.** State whether the following statements are **True** or **False.** **(10×1=10)**

(i) The gauge is a device installed at the gauging station for measuring the level of surface of water relative to a datum.

(ii) Floating method is used to measure the discharge of a river with velocity below 7.5 cm/sec.

(iii) Head lost is the energy lost from a flowing fluid due to friction, transitions, bends, etc.

(iv) The crest should be perfectly at 40% to the horizontal on either side in case of $90^0$ V-notch.

(v) The penstock pipe line is supported by Saddle-Blocks at locations where there is bend only.

(vi) The river banks and bed for stream gauging should be reasonably straight.

(vii) The forebay intake is provided with a bell mouth opening for the penstock.

(viii) The power house is generally sited below the High Flood Level.

(ix) The run-of-the-river schemes are without storage reservoirs where water is used at the rate at which it runs in the river.

(x) The bed and banks of the stream for stream gauging should be firm and stable.

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