MIZORAM PUBLIC SERVICE COMMISSION

DEPARTMENTAL EXAMINATIONS FOR
TRAINED SA / SA
UNDER PUBLIC WORKS DEPARTMENT. OCTOBER, 2015.

CIVIL ENGINEERING

Marks for each question is indicated against it.
Attempt all questions.

GROUP - A (BUILDING WORKS)

Attempt question No. 1 (one) and any other 2 (two) questions.

1. (a) Draw a long section of RCC beam resting between two masonry walls with the following data.

i) Total length of the beam = 5.40m
ii) Clear Span of the beam = 4.80m
iii) Depth of beam = 0.40m
iv) Breadth of beam = 0.25m
v) Top reinforcements = 2 nos 20mm dia Torsteel
vi) Bottom reinforcements = 4 nos 20mm dia Torsteel
vii) Stirrups = 8mm dia Torsteel
viii) Stirrups spacing = 100mm c/c within 0.80m from both the support = 150mm c/c in the remaining middle span

Also draw the cross sections near the support and the middle span. \(8+2=10\)

(b) Prepare a preliminary estimate for a double storeyed RCC building having plinth dimensions of length 15.30m and breadth of 12.30m. The plinth area rate for RCC Building may be taken as Rs.22,000/sq.m for ground floor and first floor. \(10\)

The following provisions shall be included in the preliminary estimate.

i) Site Development = Rs.4.400/sq.m of ground floor
ii) Earthquake Resistant area = Rs.1,500/sq.m of the whole plinth
iii) Internal Electrifications = 12.50%
iv) Water Supply and Sanitary Fittings = 7.50%
v) Quality Control = 1%
2. (a) Draw a plan and longitudinal section of a septic tank with the following dimensions. (10)
   i) Internal Length = 3.00m
   ii) Internal Breadth = 1.50m
   iii) Depth of Water = 1.20m
   iv) Freeboard = 0.30m
   v) Wall thickness = 150mm
   vi) Location of Baffle Wall = 0.60m from inlet
   vii) Inlet pipe = 100mm dia T – PVC Pipe
   viii) Outlet Pipe = 100mm dia T-PVC Pipe
   ix) Slope of septic tank Floor = 1 in 20 towards inlet
   x) Thickness of PCC Bed = 150mm

(b) Explain the working principle of a septic tank. (3)

c) Why are the depth of septic tanks kept shallow? (2)

3. Answer the following questions (5×3=15)
   (a) What is the difference between nominal mix and design mix of concrete?
   (b) What is the advantage of using circular column over rectangular column for the same section and same reinforcements?
   (c) What is the difference between Plain Cement Concrete and Reinforced Cement Concrete?
   (d) What is meant by water cement ratio? What is the effect of excess water on the strength of concrete during mixing?
   (e) What is the main difference between Portland Pozzolana Cement and Ordinary Portland Cement?

4. Fill in the blanks. (15×1=15)
   (a) For M20 grade concrete, the strength of 150×150×150mm cube at 28 days shall not be less than __________ N/mm²
   (b) The minimum diameter of reinforcing bar to be used in RCC column is __________ mm.
   (c) The minimum percentage of steel in RCC column is __________ % of area of concrete.
   (d) Storage of cement __________ the strength of concrete.
   (e) The weight of 12m length 20mm dia reinforcing bars is __________ kg.
   (f) Vicat Apparatus is used for testing __________ of cement.
   (g) Concreting under direct sunlight causes __________ in the concrete surface.
   (h) Removal time of scaffolding for beams having span less than 4.5m is __________ days.
   (i) Cement concrete laid at the top of retaining wall between parapets is known as __________.
   (j) For the same load, the lower the bearing capacity of the soil, the __________ the size of a foundation.
   (k) The slab covering the staircase at the roof in known as __________.
   (l) A small beam placed above chaukhat is known as __________.
   (m) Slump test is used to determine the __________ of concrete.
   (n) Humidity causes __________ of cement in bag.
   (o) The higher the height of the earth to be retained, the __________ the base of retaining wall.
GROUP - B (ROAD WORKS)

Attempt question No. 5 (five) and any other 2 (two) questions.

5. (a) Draw a cross section of an intermediate lane road with the following data. (10)
   
   i) Formation width = 10.00m
   ii) Carriageway width = 5.50m
   iii) Side Drain = top width 0.60m
       = bottom width 0.45m
       = depth 0.60m
   iv) GSB = 250mm
   v) WBM Grade I = 100mm
   vi) WBM Grade II = 75mm
   vii) OPC = 25mm
   viii) Sealcoat

   (b) Using the above data find out the quantities within 1 km length of the road on the following items with appropriate units. (10)
   
   i) Earthwork for side drain
   ii) GSB
   iii) WBM Grade I
   iv) WBM Grade II
   v) OPC 25mm
   vi) Seal Coat

6. (a) What is Passing place and why is it needed in a road? What is the requirement of passing places in a road? Mention the length and width of a passing place in a hill road. (10)
   (b) On what basis will you decide whether to use Hume Pipe Culvert or RCC Slab Culvert for a road? (5)

7. (a) Write Short Notes on (5x1=5)
   
   i) Back Pillars
   ii) Job Pillars
   iii) Catch Water Drains
   iv) Causeway
   v) 200m Stone

   (b) Write the full form of (5x1=5)
   
   i) IRC
   ii) AIV
   iii) MDD
   iv) SDBC
   v) BC

   (c) Differentiate between the following (5x1=5)
   
   (1) Km Stone and 5th Km Stone
   (2) Prime Coat and Tack Coat
   (3) Causeway and Subway
   (4) Flexible Pavement and Rigid Pavement
   (5) Liquid Limit and Plastic Limit
8. (a) Choose the correct answer

i) Minimum thickness for rigid pavement is
   (a) 150mm  (b) 100mm  (c) 125mm  (d) 175mm

ii) Designed Flexible Pavement thickness depend upon
   (a) CBR  (b) AIV  (c) Rainfall intensity  (d) Traffic Density

iii) Maximum water absorption allowed for aggregate to be used for 20mm thick Premix Carpet shall be
   (a) 1%  (b) 1.50 %  (c) 2%  (d) 2.50 %.

iv) Steel beam acting as a cross beam in a Bailey Bridge is
   (a) Raker  (b) Stringer Beam  (c) Transom  (d) Chord Reinforcement

v) The formation width for a double lane National Highway is
   (a) 12m  (b) 12.50m  (c) 10m  (d) 10.50m

(b) Fill in the blanks

i) The standard diameter of NP3 Hume Pipe is _________ metres.

ii) The minimum grade of concrete to be used for rigid pavement shall be ________.

iii) The full width of land acquired before finalising a highway alignment is known as ________.

iv) Maximum superelevation on hill roads should not exceed ________%.

v) An exceptional gradient upto 1 in 12 may be provided along hill roads only if the length does not exceed _________m per km.

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