MIZORAM PUBLIC SERVICE COMMISSION

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

CIVIL ENGINEERING

Time Allowed : 3 hours   F.M. : 100   P.M. : 40

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   = I 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/mm^2

    (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   **(5×1=5)**

    i) Back Pillars

    ii) Job Pillars

    iii) Catch Water Drains

    iv) Causeway

    v) 200m Stone

  (b) Write the full form of   **(5×1=5)**

    i) IRC   ii) AIV

    iii) MDD   iv) SDBC

    v) BC

  (c) Differentiate between the following   **(5×1=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   **(5×1½=7½)**

      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   **(5×1½=7½)**

      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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