2010   200042

CIVIL ENGINEERING - II (OPTIONAL)

Standard : Degree   **Total Marks : 200**

Nature : Conventional   **Duration : 3 Hours**

Note :

(i)   *Answers must be written in* **English***.*

(ii)   *Question* **No. 1** *is* **Compulsory***. Of the remaining questions, attempt* **any four** *selecting one question from* **each section***.*

(iii) *Figures to the* **RIGHT** *indicate marks of the respective question.*

(iv)   *Use of log table, non-programmable calculator is permitted, but any other table/code/reference book are not permitted.*

(v)   *Make suitable assumptions, wherever be necessary and state the same.*

(vi)   *Number of optional questions upto the prescribed number in the order in which they have been solved will only be assessed. Excess answers will not be assessed.*

(vii) *Credit will be given for orderly, concise and effective writing.*

(viii) *Candidate should not write roll number, any name (including their own), signature, address or any indication of their identity anywhere inside the answer book otherwise he/she will be penalised.*

Marks

1.   Answer *any four* of the following : (10 marks each)

   (a)   (i)   Derive the expression for time required to empty the tank using orifice.   4
         (ii)   What are distorted models? Why they are preferred for modelling rivers ?   6

   (b)   (i)   Explain various types of canals according to various classification system.   5
         (ii)   What are the advantages and disadvantages of canal lining ?   5

   (c)   What is a traffic rotary? State its advantages and limitations. Explain briefly the   10
         various design factors that are to be considered in the design of rotary.

   (d)   (1)   Define the Hazardous Waste. What are the characteristics of the Hazardous   5
                Waste?

         (2)   Define Air Pollution. Explain in brief 'Greenhouse effect' and 'Depletion of   5
                stratospheric Ozone.

   (e)   Explain the CBR method of pavement design.   10

P.T.O.

SECTION - A

2. Answer the following sub-questions :

   (a) (i) Define the term 'centre of pressure'. Prove that centre of pressure will never   7
           be above the centroid of plane surface immersed in liquid.

       (ii) Distinguish between rotational and irrotational flow.   3

   (b) What are the characteristics of Critical flow? A discharge of 18 cumec flows   10
       through a rectangular channel 6m wide at a depth of 1.6m. Show that the flow is
       not critical. Also calculate the depth of flow alternate to the given depth.

   (c) How the turbines are classified? What factors do you consider for selection of   10
       turbine for a given hydropower project ?

   (d) (i) What are velocity potential and stream functions? Express the condition in   5
           terms of stream function for irrotational flow.

       (ii) Describe how the Reynolds experiment demonstrate type of flow.   5

3. Answer the following sub-questions :

   (a) (i) State Newtons law of viscosity. How do you distinguish between Newtonian   3
           and Non-Newtonian fluids ?

       (ii) What is flow net? Give its applications. Also list the methods of drawing   7
           flow net.

   (b) What do you understand by most economical channel section ? An open channel   10
       of most economical section having the form of a half hexagon with horizontal
       bottom is required to pass a maximum discharge of 20.2 cumec of water. The
       slope of the channel bottom is 1 in 2500. Considering Chezy's constant equal to
       60, determine the dimensions of the cross section of channel.

   (c) Define the term 'Specific Speed' of a centrifugal pump and obtain expression for   10
       it. A single stage centrifugal pump with impeller diameter of 300mm rotates at
       2000rpm and lifts 3 cubic metre of water per second to a height of 30 mtr. Find
       the number of stages and diameter of each impeller of a similar multistage pump
       to lift 5 cubic meter of water per second to a height of 200 mtr when rotating at
       1500 rpm.

   (d) (i) State continuity equation for three dimensional flow and show that the   5
           flow is continuous if the velocity components are given by equations,

           u=xy and $v = x^2 - \dfrac{y^2}{2}$

       (ii) Differentiate between laminar and turbulent flow. Give one example for   5
           each.

SECTION - B

4.   Answer the following sub-questions :

(a)   Explain with sketch the component parts of single peaked hydrograph. What are   **10**
        the basic assumptions made in the Theory of Unit Hydrograph.

(b)   (i)   Write short note on artificial recharge of ground water.   **5x2=10**

        (ii)   Explain the terms permeability and transmissibility.

(c)   (i)   Explain the procedure adopted for calculation of reservoir capacity for a
                specified yield from mass inflow curve.   **5x2=10**

        (ii)   Write short note on Life of reservoir.

(d)   Explain with neat sketches the various modes of failures of earth dams.   **10**

5.   Answer the following subquestions :

(a)   (i)   Explain how infiltration capacity is determined by using infiltrameter.   **5**

        (ii)   A flood of a certain magnitude has a return period of 25 years. What is its   **5**
                probability of exceedence? What is probability that this flood may occur in
                the next 12 years.

(b)   Explain with neat sketch various zones of underground water.   **10**

(c)   (i)   Differentiate between flood control reservoir and multipurpose reservoir.   **5**

        (ii)   Write short note on Economic hight of a dam.   **5**

(d)   List the various types of spillways and explain in detail the "Ogee Spillway"   **10**

SECTION - C

6.   (a)   The following lengths and bearings were recorded in running a closed traverse   **10**
            ABCDEA. The length and bearing of line EA is omitted. Determine length and
            bearing of Line EA.

Line	Length in (m)	Bearing
AB	100.2	115° 20'
BC	115.8	45° 30'
CD	157.4	285° 12'
DE	190.2	310° 24'
EA	------	------

(b)   Describe various segments of GPS and explain the principle of working of GPS.   **10**
        State any four applications of GPS.

Marks

(c) (i) Compare between wooden sleepers and concrete sleepers with respect to any five important points.   **5**

      (ii) The radius of horizontal circular curve of a road is 150m. The design speed of vehicle is 60 kmph and design coefficient of lateral friction is 0.15. Calculate the superelevation if full lateral friction is assumed to develop. Also calculate the coefficient of friction needed if no superelevations is provided.   **5**

(d) Discuss in detail the various factors deciding the alignment of roads.   **10**

7. (a) What is triangulation? Describe various Geometrical figures used in triangulation system. Differentiate between primary and secondary triangulations.   **10**

   (b) Two tangents intersect at a chainage of 1200m, the deflection angle being 40°. Calculate the data necessary for setting out a circular curve with a radius of 250m by Rankines method of deflection angles.   **10**

      Assume peg interval =20m

   (c) (i) State the various functions of ballast in permanent way and state requirements of good ballast material.   **5**

      (ii) Calculate the extra widening required for a pavement of width 7m on a horizontal curve of radius 300m, if the longest wheel base of vehicle expected on the road is 7m. Design speed is 60 kmph.   **5**

   (d) State various applications of Origin and Destination studies and explain any two methods adopted for carrying out these surveys.   **10**

SECTION - D

8. Answer the following sub-questions.

   (a) (i) What are the objectives of Public Water Supply System ?   **5**

      What are the physical, chemical and bacteriological standards for the potable water ?

      (ii) Draw a hydraulic flow diagram for a conventional water treatment plant.   **5**

   (b) (i) What is a servics reservoir? Give its importance in a water distribution system.   **5**

      (ii) Write a short note on Hydraulic requirements of water distribution systems.   **5**

   (c) (i) Compare seperate and combined system of sewers.   **5**

      (ii) Explain why sewers are generally designed as partially full sewers.   **5**

      Also mention the conditions when two sewers are hydraulically equivalent.

P.T.O.

Marks

(d) (i) The MLSS concentratin in an Aeration tank is 2500 mg/lit and sludge volume 5 after 30 minutes of settling in a 1000 ml. graduated cylinder is 215ml. Calculate :

    (I) SVI

    (II) SD1

    (III) Required return sludge ratio.

    (IV) SS concentration in the recirculated sludge.

(ii) What are the characteristics of an Municipal Solid Waste Sanitary Landfill ? 5

9. Answer the following sub-questions.

(a) (i) Find the settling velocity of a particle in water for the following details. 5 Diameter of particle =0.06mm.

Specific gravity of particle = 2.65

Temperature of water = 20°C

Kinematic Viscosity of water at 20°C

             = 1.007 centistokes.

(ii) Design the dimensions of a set of Rapid Sand Gravity Filters for treating 5 water required for a population of 1,00,000 with an average rate of demand of 200 lpcd.

Assume maximum demand as 1.8 times the average demand. Assume rate of filtration will be 5000 lit/hr/m^2.

(b) (i) What are the different types of valves used in the water distribution systems. 5 Briefly explain the use and operation of each type of valve.

(ii) What is a hydraulically balanced pipe network ? What is the sum of the 5 head losses around a balanced pipe loop ?

(c) (i) Calculate the value of base 10 rate constant K. 5

    (I) If 90% of ultimate BOD is satisfied in 05 days.

    (II) If 70% of ultimate BOD is satisfied in 05 days.

(ii) Write an exhaustive note on self purification of Natural streams. 5

(d) (i) Design a Septic tank for 250 users. Water allowance is 120 lpcd. Detention 5 period may be taken as 8 hrs.

(ii) What is Leachate? How is it controlled? 5

What is mean by Landfill gases? How is it conrolled ?

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