(3 Hours)   [Total Marks : 80]

Notes :

1. Question No **ONE** is **Compulsory**.

2. Answer any **THREE** from remaining.

3. Draw **FIGURES** wherever necessary.Figures to the right indicate full marks.

4. **WRITE** proper question / sub question numbers on the left margin allotted in answer sheet.

5. Each Question carries **EQUAL** marks.

6. **ASSUME** any additional data if necessary and state it clearly.

1.		**Attempt (Any 4)**	
	a)	Explain the factors affecting location of intake structure.	05
	b)	Calculate the discharge of 1.0 m circular sewer laid at a slope of 1 in 500, When it is running half full. Assume n in manning's formula as 0.012.	05
	c)	Give the acceptable limits of the following for the public drinking water i) Turbidity ii) Hardness iii) Iron iv) Chlorides v) pH	05
	d)	How to remove oil and grease in the sewage treatment?	05
	e)	How does rooftop rainwater harvesting contribute to the water conservation?	05
	f)	Explain 5R principle in Solid waste management.	05
2.	a)	A Filter unit is 4.5m x 9 m. after filtering 11000 cubic meter per day in 24-hour period, the filter is backwashing at a rate of 12 lit/sq.m/sec for 20 minutes. Compute the average filtration rate, Quantity and percentage of treated water in washing.	10
	b)	What are the different systems of Plumbing? Explain with diagram single stack and Two pipe system.	10
3.	a)	Write a note on Break point chlorination with neat sketch.	5
	b)	Draw typical layout of water treatment plant and write functions of each unit briefly.	10
	c)	The 5 day 30^0 C BOD of sewage sample is 100 mg/l. Calculate its 5 days 20^0C BOD. Assume the deoxygenation constant at 20^{0C}, K_{20} as 0.1.	5
4.	a)	Calculate the amount of bleaching powder required in kg/day for 20 MLD of water. The filtered water exerts a chlorine demand of 0.2mg/lit chlorine available from beaching powder is 40%.	05

	b)	Draw a flow chart of activated sludge process and explain the treatment units involved in it.	05
	c)	Design a rectangular sedimentation tank to treat 6MLD of water. Assume data wherever required and check for surface loading and wear loading.	10
5.	a)	Design a septic tank for colony of 200 persons, having sewage /capita /day is 130 lit, desludging period is 2 years and length: width is 4:1. Enlist the method used for disposal of septic tank effluent.	10
	b)	What is meant by disinfection in treating public water supply? What is its importance? Discuss the role of chlorine as a disinfecting agent with reference to its disinfecting action and its doses.	10
6.	a)	Enlist different methods for water softening. Explain Zeolite process with neat sketch.	05
	b)	Define S.V.I. and its significance in the context of sewage treatment?	05
	c)	Enlist the types of distribution system sand explain any one in detail.	05
	d)	What are the health impacts of air pollution, and how can air pollutants be categorized?	05

Time: 3 Hours   **Marks :80**

N. B.:   (1) Question No. 1 is compulsory.
                (2) Attempt any three from the remaining five questions.
                (3) Figures to the right indicate the full marks.
                (4) Assume suitable data if not given and justify the same.

			Marks
Q. 1.		Attempt any four	
	A.	Explain the primary consolidation by the spring analogy method.	5
	B.	What are the assumptions of Rankine's Theory for lateral earth pressure?	5
	C.	Discuss the factors influencing the bearing capacity of soil.	5
	D.	Explain the Dynamic Formulae for analyzing the load carrying capacity of Piles.	5
	E	Explain Taylor's stability Number to analyze the stability of slopes.	5
	F	Explain the liquefaction of soil.	5

Q.2.   A.   A triaxial compression test on a cohesive sample cylindrical in shape, yields the   10
              following effective stresses.
              Major Principal stress is 9MN/m^2, Minor Principal stress is 3MN/m^2
              Angle of inclination of the rupture plane is 60° to the horizontal. Present the above data
              using a Mohr's Circle of stress diagram. Find the angle of internal friction.

        B.   A layer of soft clay is 8 m thick and lies under a newly constructed building. The   10
              weight of sand overlying the clayey layer produces a pressure of 250 kN/m^2 and the
              new construction increases the pressure by 120 kN/m^2. If the compression index is
              0.44, compute the settlement. Water content is 38 % and specific gravity of grains is
              2.67

Q.3.   A.   A square column foundation is to be designed for a gross allowable total load of   10
              350 KN. If the load is inclined at an angle of 10˚ to the vertical, determine the width of
              the foundation. Take factor of safety of 3.0 and use IS Code Method.
              γ=20KN/m^3 , ϕ =33˚, C= 26 KN/m^2 .The depth of the foundation is 1 m. (Nc = 47,
              Nq=34, Nγ=48.03)

        B.   Explain the procedure of Pile Load Test. How is the allowable load calculated as per IS   5
              recommendations?

        C.   Compare Rankine's and Coulombs lateral earth pressure theory.   5

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Q.4. **A.** A deep cut of 10m depth is made in natural soil for the construction of a road. The properties of soil are: C =25 KN/m^2, ϕ =20°, γ=20 KN/m^3. The slope angle of the cut is 320. Consider a trial slip circle of radius 18 m passing through the toe and cutting the top ground surface at a distance of 6m from the top edge. Determine the factor of safety with respect to cohesion for the given slip circle by the Friction Circle Method. Assume a factor of safety as 1.8. **10**

B. A retaining wall 12m high retains sand with ϕ = 32° and γ = 22 kN/m^3 upto a depth of 6m from the top. From 7 to 12m, the material is a cohesive soil with having C=30 KN/m^2 and, ϕ = 25° and γ = 20 kN/m^3. The water table is at a depth of 6 m from the ground level. γsat=22 kN/m^3 for cohesive soil. Find the total active thrust on the wall along with its point of application. A retaining wall also carries a uniform surcharge of 50 KN/m^2 on the top of soil. **10**

Q. 5 **A.** Determine load carrying capacity of piles having following properties . **10**
Diameter of pile =0.4m, Length of pile = 15 m , γ_d = 16 KN /m^3 , γ_{sat} = 19 KN/m^3 .
K tan δ= 1.5, critical depth of pile as 7.5 times diameter of pile, Nq = 70. Properties of clay is γ_{sat} = 20 KN /m^3. Soil deposit consists of sand of 20m thick followed by 4 m thick clay layer. The Ground water level is observed at 2m from ground surface.
B. Define Initial consolidation, Primary consolidation and Secondary consolidation. **5**
C. Discuss the difference between general shear failure , local shear failure and punching shear failure with neat sketch. **5**

Q. 6 **A.** Explain with a diagram Rehbann's Graphical Method for the determination of active earth pressure for cohesionless soil backfill. **10**
B. A strip footing is to be designed to carry a load of 900 kN/m at a depth of 1m. The effective shear parameters are C=0, ϕ = 40° . Find the minimum width of footing . Assume that the water table raises to ground level. γ=18 kN/m^3 and γsat=20 kN/m^3.For ϕ = 40° N$_q$ =64, N$_\gamma$ =95. Use Terzaghi's Bearing capacity theory. **10**

Duration: 3hours   **Total marks: 80**

Q.1 is COMPULSORY
Attempt any THREE out of remaining questions
Assume suitable data wherever required.

Q.1 Attempt **any FOUR** of the following   **(20)**
  A. What is the necessity of Irrigation in India and what are the disadvantages of over-irrigation?
  B. Distinguish between Kennedy's and Lacey's theory.
  C. Explain recuperation test in wells.
  D. How to derive direct runoff hydrograph from flood hydrograph?
  E. Distinguish between Elementary & practical profile of gravity dam.
  F. What is head regulator? State functions of a distributary head regulator and a cross regulator.

Q.2. A.i. Explain with the help of a diagram Symon's rain gauge.   **(05)**
  A.ii. Define Precipitation. Explain different types of Precipitation   **(05)**
      B. The ordinates of 3-h unit hydrograph for a drainage basin are given below. Obtain 9-   hr
      UH by S-curve method   **(10)**

Time (hours)	0	3	6	9	12	15	18	21	24	27	30
Ordinates of 3-h UH	0	6.5	12	25.5	45	86	79	42	9.5	4	0

Q.3. A.i Explain types of earth dam.   **(05)**
  A.ii. What is the broad classification of principal crops in India?   **(05)**

  B. Define Duty, delta & base period for a crop. Derive the relation between them.
      Also determine the reservoir capacity of the canal system if the culturable command area is
      40000hectares, canal losses are 25% and reservoir losses are 15%.
      The details of crops are as follows: **(10)**

Crop	Base period(days)	Duty at field (hec/cumec)	Intensity of irrigation (%)
Wheat	120	1800	20
Sugarcane	360	1700	20
Cotton	180	1400	10
Rice	120	800	15
Vegetable	120	700	15

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Q.4. A. i. Draw a neat diagram of confined aquifer & show its various components. **(05)**

    A.ii. What are disadvantages and suitability of canal lining? **(05)**

Q4.B. An artesian tube well has a diameter of 20cm. The thickness of aquifer is 30m and its permeability is 38m/day. Find its yield under a drawdown of 4m at the well face. Use radius of influence as recommended by Sichardt. **(10)**

Q5.   A.i. Explain with diagram different zones of Storage in reservoir. **(05)**

    A.ii. Enlist types of Spillways and explain any ONE type of spillway. **(05)**

B. Design the practical profile of a gravity dam from the following data:

    Reduced Level of base of Dam is 1600m

    Reduced Level of F. R. L. = 1625m,

    Specific Gravity of masonry = 2.5.

    Safe compressive stress for masonry = 1500 kPa.

    Height of waves = 1m.

    Assume any suitable data if required and state the same clearly. **(10)**

Q.6. A. A channel has to be designed for the following data:

    Discharge = 30cumecs

    Silt factor = 1.00

    Side slope 0.5 :1

    Find also the longitudinal slope by Lacey's theory. **(10)**

B. Describe with the help of sketches various types of Canal falls. **(10)**

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