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Code—05

CIVIL ENGINEERING

Time Allowed : 3 Hours *Maximum Marks : 150*

Note : Attempt any *Five* questions. All questions carry equal marks. Q. No. 1 is compulsory. Answer *two* questions from Part I and *two* questions from Part II. The parts of the same question must be answered together and must not be interposed between answers to other questions.

1. Attempt any *four* of the following : **(4×7½=30)**

   (a) Distinguish between method of joints and method of sections. Which is the appropriate method for influence lines ? Illustrate the method by constructing the influence line for the force in a diagonal member of Pratt truss with inclined top chord members.

   (b) Write short notes on consolidated quick tests on sands and critical void ratio.

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(c) Derive the condition $\frac{Q^2}{g} = \frac{A^3}{T}$. What type of flow condition is indicated by this equation ?

(d) State Abram's law. Describe how both strength and workability can be ensured in concrete mix.

(e) Write short note on reciprocal levelling.

(f) Briefly describe any two turbidity tests for drinking water.

Part I

2. (a) A symmetric, three hinged parabolic arch of span 'L' and height 'h' carries a concentrated load at a distance of 'z' from left support. The moment at a section distant 'x' from the left support is zero. Derive the value of 'z' in terms of L, h and x. **(20)**

(b) Derive an expression to obtain depth of embedment of cantilever sheet piles in cohesive soils. **(10)**

3. (a) An earthen bank embankment is to be constructed for an important highway. Explain briefly what preliminary investigations are required with regard to (i) selection of embankment material, (ii) selection of proper procedure of construction.

List the tests to be done for quality control. (15)

(b) Two pipes each of length 'l' and diameters D_1 and D_2 are arranged in parallel. When total discharge Q flows through them, the head loss is h_1. If the pipes are in series and total discharge is Q, the head loss is h_2. If $D_1 = 2D_2$ and $h_2 = 10$ m, find the value of h_1. Neglect minor losses. Friction factor is same for all pipes. (15)

4. (a) A T section of mild steel has the following dimensions :

Total depth = 9 cm, Breadth of flange = 8 cm, Thickness of flange and web = 1 cm. Calculate the plastic moment of the section if yield stress is 2500 kg/cm^2. (20)

(b) If stream function for steady flow is given by $\psi = (y^2 - x^2)$, determine whether the flow is rotational or irrotational. Also determine the velocity potential. (10)

Part II

5. (a) Explain the concept of a two stage digestion system and why it is required. Describe the salient features of this type of sludge digestion. (15)

(b) A water course commands an area of 800 hectares. The intensity of irrigation of rice in this area is 50%. Transplantation of rice crop takes 15 days during which period the water depth required is 60 cm. Rainfall during this period is 15 cm. Find out :

(i) Duty of water for transplantation period.

(ii) Duty at head of distributory, taking 20% loss in water courses.

(iii) Discharge required in water courses. (15)

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6. (a) Explain the difference between milestone chart and bar chart. How can a mile stone chart be developed into a network ? **(10)**

(b) Three activities to be implemented in parallel have the following time-cost relationship :

Activity	A	B	C
Time, days	10 days	11 days	7 days
Cost	Rs. 800	Rs. 1,200	Rs. 500
	9 days	10 days	6 days
	Rs. 900	Rs. 1,350	Rs. 700
	8 days	9 days	5 days
	Rs. 1,000	Rs. 1,500	Rs. 900

What will be the feasible range of total direct cost for the three activities together ? **(20)**

7. (a) Briefly describe the characteristics of a good brick. List any *three* types of defects in bricks and indicate the causes of these defects. Explain, why 'frog' is provided in bricks. What are modular bricks ? **(15)**

(b) List the possible types of errors in chain surveying. How are these errors estimated ? **(15)**