

2007  
CIVIL ENGINEERING - II (OPTIONAL)

100046

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.

1. Answer **any four** of the following :

- (a) List the various instruments available for measuring discharge through pipes. **10**  
Explain the working of any one.
- (b) (i) Explain consumptive use. Enlist the factors on which it depends. **10**  
(ii) Enlist the methods of irrigation. Describe the principles of Drip method.  
(iii) Enlist different types of canal lining. Which one is best and why ?  
(iv) What are the benefits of drainage ?  
(v) Distinguish between duty and delta.

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- |   | <b>Marks</b> |
|---|--------------|
| (c) State advantages and disadvantages of a rotary intersection after drawing a neat sketch of a rotary intersection. Write the formula used for practical capacity of a rotary intersection. Explain various terms used. | 10           |
| (d) Write short notes on the following :  | 10           |
| (i) Importance of EIA   |              |
| (ii) Control of Noise pollution   |              |
| (e) List and explain various steps involved in design of plain jointed rigid highway pavement.  | 10           |

### SECTION - A

2. Answer the following sub-questions :
- |  |    |
|--|----|
| (a) Explain the concept of capillarity. Derive the equation for capillary rise with respect to glass tube immersed in water.   | 10 |
| (b) Define the term 'hydraulic jump'. A rectangular channel carries a discharge of 2 cumec per metre width. If the loss of energy in the hydraulic jump is found to be 2.75 mtr, determine the conjugate depths before and after the jump. | 10 |
| (c) Make comparison between centrifugal pumps and reciprocating pumps.   | 10 |
| (d) (i) What is flow net ? Name the methods of drawing flow net.   | 5  |
| (ii) Give the general expression for velocity distribution for laminar flow between two parallel plates. From it derive equation for simple Couette flow.  | 5  |
3. Answer the following sub-questions :
- |  |    |
|--|----|
| (a) Derive the continuity equation for steady, three dimensional flow. Clearly state the assumptions made.   | 10 |
| (b) Define the term critical depth. Also list various characteristics of the critical flow through a channel section.  | 10 |
| (c) List various types of surge tank. What factors govern the location of surge tank ?   | 10 |
| (d) (i) For two dimensional flow, stream function $\Psi = \frac{3}{2}(x^2 - y^2)$ . Determine velocity components at the points (1, 3) and (3, 3). Also find the discharge passing through between the streamlines passing through these points. | 5  |
| (ii) With neat sketch explain the working of Siphon. Also show hydraulic grade line and total energy line in your sketch.  | 5  |

		<b>Marks</b>		
	(ii)	The $BOD_5$ of waste water is 150 mg/lit at 20°C. The $k$ value is known to be 0.23 per day (to the base $e$ ). What would be $BOD_4$ and $BOD_8$ if the test is run at 15°C.	4	
(d)	(i)	Explain the following term w.r. to Activated sludge process : F/M ratio, HRT & SRT	6	
	(ii)	Explain the different factors affecting municipal solid waste generation rate.	4	
9.	(a)	(i)	State the drinking water standards (Indian) for the following parameters : Hardness, Chloride, pH, Sulphate, Total Solids, Fluoride.	3
		(ii)	Draw a flow diagram of water treatment plant having source of water as river. Explain the working of each unit.	7
	(b)	(i)	Explain the Hardy Cross method of analysis of distribution network.	6
		(ii)	Explain different methods of detection of leakages in distribution system.	4
	(c)	(i)	Explain the merits and demerits of separate and combined sewerage system.	4
		(ii)	Draw a typical D.O. Sag curve. Explain the significance of same in stream pollution.	6
	(d)	(i)	Determine the size of high rate trickling filter for the following data.	6
			Sewage flow                               4.5 m <sup>3</sup> /d	
			Recirculation ratio                     1.5	
			BOD of raw sewage                     250 mg/lit.	
			BOD removal in primary treatment   = 30%	
			Final effluent BOD desired          = 30 mg/lit.	
	(ii)		Explain the different functional outline elements of solid waste management system.	4

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## SECTION - B

Marks

4. Answer the following sub-questions :
- |     |      |  |   |
|-----|------|--|---|
| (a) | (i)  | Define hydrological cycle. Discuss the steps in the process of circulation and redistribution of Hydrological cycle. | 5 |
|     | (ii) | Give the types of precipitation and discuss cyclonic precipitation.  | 5 |
| (b) | (i)  | Define the following (any three) :   | 6 |
|     | (1)  | Confined aquifer   |   |
|     | (2)  | Perched aquifer  |   |
|     | (3)  | Unconfined aquifer   |   |
|     | (4)  | Storage coefficient  |   |
|     | (ii) | Define coefficient of permeability and specific yield.   | 4 |
| (c) | (i)  | Explain in brief Retarding and Detention Reservoir.  | 5 |
|     | (ii) | State the different points to be considered while selecting a site for reservoir.                                    | 5 |
| (d) | (i)  | Describe the working of a spillway. Describe the phenomenon of energy dissipation.                                   | 5 |
|     | (ii) | What are the objectives of River Training works ? Enlist different methods of river training.                        | 5 |
5. (a) Describe in brief the factors affecting infiltration. State the different methods of flood estimation and describe flood frequency method. 10
- (b) Enlist different surface method of ground water investigation. State advantages and disadvantages of tube well irrigation. What is an ideal tube well ? 10
- (c) (i) Define the following : 4
- (1) Active capacity of a reservoir.
- (2) Carry over storage.
- (ii) Describe in brief the trap efficiency of a reservoir and enlist the different factors affecting silting of a reservoir. 6
- (d) What are the different causes of water logging ? Give its ill effects. 10
- What is overtopping ? How can it be avoided ? Enlist the factors responsible for stability of a gravity dam.

- (d) Results of a speed study is given below. Plot the histogram and cumulative frequency curve. Marks  
4+2+2+2

Determine the speeds used for

- (i) geometric design
- (ii) Traffic regulation
- (iii) Lower speed limit.

Speed class limits kmph	No. of Vehicles
(i) 26 - 30	9
(ii) 30 - 34	74
(iii) 34 - 38	79
(iv) 38 - 42	75
(v) 42 - 46	66
(vi) 46 - 50	33
(vii) 50 - 54	17
(viii) 54 - 58	6
(ix) 58 - 62	1
(x) 62 - 66	3

#### SECTION - D

8. (a) (i) Explain the significance of any three chemical water quality parameters. 6
- (ii) Explain the need of rainwater harvesting. Explain any one method in brief. 4
- (b) (i) List the different types of Distribution system layouts and explain suitability and limitations of them. 5
- (ii) Differentiate between slow sand filter and rapid sand filter. 5
- (c) (i) Explain the following sewer appurtenances with neat sketch : 6
- (1) Manhole                      (2) Flushing tank

## SECTION - C

6. (a) State advantages and disadvantages of plain tabling. 10
- (b) Explain the following terms : 10
- (i) Line of collimation
- (ii) Axis of Telescope
- (iii) Bubble line
- (iv) Face left and face right
- (v) Latitudes and departures
- (c) (i) Compare various materials used for a railway sleepers. 5
- (ii) Explain the bulk and the apparent specific gravities for aggregates. 5
- (d) State various criteria which must be satisfied by filter layer. 10
- For a following particle size distribution of subgrade soil, design a suitable aggregate gradation for a filter layer, to be laid over the subgrade.

Particle size (mm)	4.75	2.36	1.18	0.6	0.3	0.15	0.01
% finer	100	88.4	68.2	49.7	34.4	8.1	1.0

7. (a) What is reciprocal levelling ? State its uses. Explain the procedure in short. 10
- (b) Describe following instruments in brief and state their uses. 10
- (i) Hand level
- (ii) Abney level
- (iii) Box sextant
- (iv) Indian pattern clinometer
- (v) Ceylon Ghat Tracer
- (c) (i) Classify and explain various marshalling yards. Draw a neat sketch of a 3+2 hump marshalling yard. 3+2
- (ii) Explain various distresses in flexible pavements. 5

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