

**2006**  
**CIVIL ENGINEERING - II (OPTIONAL)**

Standard : Degree

000063

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 will be penalised.

1. Answer **any four** from the following sub-questions :

- (a) In a prismatic reservoir the discharge from a circular orifice situated at the base is 2100 litres in T seconds, under a constant head of 9 m. If the discharge is to be the same under a falling head starting from 16 m, by how much should it fall during the same time of T seconds. What is the area of the reservoir surface? Assume the coefficient of discharge to be constant. 10

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- |  | Marks |
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| (b) Write short notes on the following :   | 10    |
| (i) Permanent wilting point  |       |
| (ii) Duty and delta  |       |
| (iii) Canal head regulator   |       |
| (iv) factors to be considered while deciding alignment of a canal  |       |
| (v) Bandhara irrigation  |       |
| (c) What is traffic rotary ? Give its advantages and limitations.  | 10    |
| (d) What are the meteorological factors influencing air pollution. Enlist all primary and secondary factors. | 10    |
| (e) Discuss the requirements of vertical curves and its shape in highway.                                    | 10    |

### SECTION - A

2. Answer the following sub-questions :
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| (a) Explain the characteristics of stream lines. Differentiate stream lines, path lines and streak lines.  | 10 |
| (b) A river 100 m wide and 3 m deep has stable bed and vertical banks with a surface slope of 1 in 2500. Estimate the length of backwater curve produced by an efflux of 1.5 m. Assume manning's constant as 0.030.              | 10 |
| (c) A turbine is to operate under a head of 24 m at 240 rpm. The discharge is 12 cumec. If the efficiency is 92%. Determine the specific speed of the turbine and power generated by it.   | 10 |
| (d) (i) Find the density of a conical body floating at the interface of mercury and water with its apex pointing downward into the mercury. Half of its height is immersed in mercury. Take specific gravity of mercury as 13.6. | 10 |
| (ii) Explain the difference between turbulent and laminar boundary layers.   |    |
3. Answer the following sub-questions :
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| (a) A cubical tank has side of 2 m. It contains mercury of specific gravity 13.6 for lower 0.5 m depth, water in the middle 1 m and oil of specific gravity 0.9 in the top 0.5 m. Calculate the total pressure and center of pressure on one of the vertical side of tank. | 10 |
| (b) A trapezoidal channel with side slopes of 1 : 1 has to be designed to carry $10^3$ m <sup>3</sup> /sec at a velocity of 2 m/s so that the amount of concrete lining over the wetted perimeter is minimum. Find the width and depth of the channel flow.                | 10 |



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| (c) What is an air vessel ? Explain its functions in a reciprocating pump.  | <b>10</b>    |
| (d) (i) Differentiate between a forced vertex and free vertex.  | <b>10</b>    |
| (ii) A 60 cm dia and 3600 m long pipe is connected between two reservoirs. It is discharging at 500 litres/sec into the lower reservoir, whose water level is 21 m below the upper reservoir. If a discharge of 100 litres/sec is to be taken out from the midpoint of 3600 m long pipe using another pipe, what will be the change in discharge into the lower reservoir ? |              |

### SECTION - B

4. Answer the following sub-questions :

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|---|-----------|
| (a) Explain Hydrologic cycle with the help of a sketch and explain man's interference in various parts of this cycle.   | <b>10</b> |
| (b) A pumping test was made in a medium sand and gravel to a depth of 15 m where a bed of clay was encountered. The normal ground water level was at surface. Observation wells are located at 5 m and 10 m from the pumping well. At a discharge of 3.6 lit/sec from pumping well a steady state was attained in about 25 hours. The drawdown at 5 m was 1.5 m and at 10 m was 0.3 m. Compute coefficient of permeability of soil. | <b>10</b> |
| (c) Define and explain various types of reservoirs.   | <b>10</b> |
| (d) What are the causes and effects of water logging ?  | <b>10</b> |

5. Answer the following sub-questions :

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| (a) There are four rain gauge stations existing in the catchment of a river. The average rainfall values at these stations are 700 mm, 820 mm, 400 mm and 540 mm respectively. Determine the optimum number of rain gauges in the catchment if it is desired to limit the error in the mean value of rainfall to 10% | <b>10</b> |
| (b) Define the following terms :   | <b>10</b> |
| (i) Confined aquifer   |           |
| (ii) Unconfined aquifer  |           |
| (iii) Field capacity   |           |
| (iv) Specific yield  |           |
| (v) Coefficient of transmissibility  |           |
| (c) Explain mass inflow curve, demand curve and method of calculating reservoir capacity from these curves.  | <b>10</b> |
| (d) What is meant by gravity dam ? Explain with sketches the forces that may act on a gravity dam, indicate their magnitude direction and location.  | <b>10</b> |

## SECTION - C

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6. Answer the following sub-questions :

- (a) The following consecutive readings were taken with a level and 4 m staff on a continuously sloping ground at a common interval of 30 m. 10  
0.780, 1.535, 1.955, 2.430, 2.985, 3.480, 1.155, 1.960, 2.365, 3.640, 0.935, 1.045, 1.630 and 2.545. The reduced level of first point was 180.750. Rule out a page of a level field book and enter the above readings. Calculate the reduced levels of the points by rise and fall method.
- (b) What is meant by transition curve ? Give reasons for introducing transition curve on railways and roads. 10
- (c) (i) What are the desired qualities of good sleepers ? 10  
(ii) Give the typical cross-section of road in cutting.
- (d) What is superelevation ? Calculate superelevation for a horizontal circular curve of radius 140 m. The design speed is 60 kmph and the design coefficient of lateral friction is 0.15. Also calculate coefficient of friction needed if no superelevation is provided. 10

7. Answer the following sub-questions :

- (a) Explain the two point problem and procedure to solve it with plane table survey. 10
- (b) To determine the elevation of the first station A of a tacheometric survey, the following observations were made, the staff being held vertically. The instrument was fitted with an anallatic lens and the value of the constant was 100. 10

Inst. Station	Height of Instrument	Staff station	Vertical angle	Staff readings	Remark
O	1.440	B.M.	-5° 40'	1.332, 1.896, 2.460	R.L. of B.M. = 158.205 m.
O	1.440	C.P.	+8° 20'	0.780, 1.263, 1.746	
A	1.380	C.P.	-6° 24'	1.158, 1.617, 2.076	

- (c) (i) List various rail fastenings and give their function. 10  
(ii) Define various types of sight distances.
- (d) Discuss various traffic field studies and their importance. 10

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## SECTION - D

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| 8. | (a) | (i)  | What are the methods of rainwater harvesting, explain in brief.  | 4  |
|    |     | (ii) | List out data required to design a rainwater harvesting scheme, also mention the formula to calculate runoff.  | 6  |
|    | (b) | (i)  | Explain methods of water distribution with sketches.   | 5  |
|    |     | (ii) | List the layouts of distribution network for piping.   | 5  |
|    | (c) | (i)  | Explain in brief significance of BOD/COD ratio.  | 4  |
|    |     | (ii) | Differentiate between Land Disposal method and Water Disposal method (Dilution method) for sewage disposal.  |    |
|    | (d) |      | Draw a flow diagram of a "Sewage Treatment Plant" for a large size city, and explain working of each unit in detail (4 for sketch, 6 for Explanation). | 10 |
| 9. | (a) | (i)  | Explain in brief.<br>Types of water demand and factors affecting per capita demand of water.   | 8  |
|    |     | (ii) | Explain why chlorine is used for water treatment.  | 2  |
|    | (b) | (i)  | Enlist the function of distribution reservoirs.  | 5  |
|    |     | (ii) | What do you understand by storage capacity of distribution reservoir stated below :  | 5  |
|    |     | (a)  | Balanced storage   |    |
|    |     | (b)  | Breakdown storage  |    |
|    |     | (c)  | Fire storage   |    |
|    | (c) | (i)  | Name two most important parameters used to characterize sewage and describe their significance.  | 4  |
|    |     | (ii) | What is BOD, and deduce an expression for first stage BOD.   | 6  |
|    | (d) |      | Explain in detail the methods adopted for collection and disposal of solid waste in rural and urban areas.   | 10 |

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