

CIVIL ENGINEERING

PAPER—II

Full Marks : 200

Time : 3 hours

*The figures in the margin indicate full marks*

Candidates should attempt any **two** Sections completely out of **four** Sections—A, B, C and D

SECTION—A

1. (a) Discuss different types of mortar used in brick masonry. 4
- (b) Discuss first class, second class and third class bricks. 8
- (c) What is bond in brickwork? Discuss different types of bonds in brickwork. 8
2. (a) What are the various causes of dampness in building? 6
- (b) Discuss the methods of damp proofing. 8
- (c) What are the ideal characteristics of damp-proofing material? 6
3. (a) What are the advantages of cavity walls? 6
- (b) What are the objects of plastering? 7
- (c) What are the characteristics of an ideal paint? 7

4. (a) What are the fire-resisting properties of common building materials? 10
- (b) What are the general fire safety requirements for buildings? 10
5. (a) How will you determine the setting times of cement in the laboratory? 10
- (b) What are chemical admixtures? Describe briefly the different admixtures used (any three). 10

SECTION—B

6. (a) What are the main recommendations and drawbacks of the NTPC in respect of roads and transports? 10
- (b) Describe the stages involved in preparing a national transport sector plan. 10

7. (a) Define design speed in geometric design. What are the suggested design speeds in India for rural and urban conditions? What is the distinction between ruling and minimum design speeds, and where are they adopted? 10
- (b) Derive, from fundamentals, the equation used for calculating the super-elevation in India,  $e = \frac{V^2}{225R}$ . 10

19. (a) What are the different types of sewerage system? What are the advantages of each? 10
- (b) Write short notes on the following : 10
- (i) Drop manhole
- (ii) Activated sludge process
20. (a) Explain various methods of disposal of solid waste. 10
- (b) Explain the environmental impact assessment for mines. 10

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## SECTION—D

16. (a) What do you mean by per capita demand? What are the various factors which affect per capita demand? 10
- (b) What are intakes? Describe a river intake. 10
17. (a) What do you mean by coagulation? Which are the coagulants used and what are the advantages of each? 10
- (b) Design a coagulation-cum-sedimentation tank with continuous flow for a population of 60000 persons with a daily per capita allowance of 120 litres. Make suitable assumptions. 10
18. (a) Explain the following : 10
- (i) Desalination
- (ii) Reverse osmosis
- (b) Explain, with the help of a neat sketch, a pressure filter. What are its advantages over slow sand filter? 10

12Y—100/24

( Continued )

8. (a) What are the considerations in selecting a highway alignment? What special considerations are needed in hilly areas and in desert areas? 10
- (b) What are the stages in highway route location and survey using conventional survey techniques? Describe them. 10
9. (a) Explain the method of flexible pavement design as per IRC (1970). What improvements have been made in IRC Guideline in 1984? 10
- (b) Determine the thickness of a flexible pavement by Burmister's two-layer theory for a wheel load of 40 kN and tyre pressure of 0.5 MN/m<sup>2</sup>. The modulus of elasticity of the pavement material is 120 MN/m<sup>2</sup> and that of the subgrade is 12 MN/m<sup>2</sup>. The value of  $F_w$  for  $E_1/E_2$  of 10 can be taken as under :

Thickness of top layer	$F_w$
0.5a	0.8
1.0a	0.5
2.0a	0.3

The allowable deflection is 0.5 cm. 10

12Y—100/24

( Turn Over )

10. (a) How is the optimum cycle of signal determined? Describe the size, shape and colour of (i) warning signal, (ii) prohibitory signal, (iii) mandatory signal and (iv) informative signal. 10
- (b) Discuss how highway design can enhance road safety. 10

SECTION—C

11. (a) Explain the unit hydrograph theory. How is a unit hydrograph prepared from an isolated storm? 10
- (b) A 30 cm diameter well penetrates 25 m below the static water table. After 24 hr of pumping at the rate of 5400 L/min, the water level in a test well at 90 m is lowered by 0.53 m and in a well 30 m away, it is lowered by 1.11 m.
- (i) What is the transmissibility of the aquifer?
- (ii) What is the drawdown in the main well? 10
12. (a) Explain any one method of flood routing. 10
- (b) Determine the field capacity of a soil for the following data : 10
- (i) Depth of root zone = 1.8 m
- (ii) Existing moisture = 8%

- (iii) Dry density of soil = 1450 kg/m<sup>3</sup>
- (iv) Quantity of water applied to the soil = 650 m<sup>3</sup>
- (v) Water lost due to deep percolation and evaporation = 10%
- (vi) Area to be irrigated = 1000 m<sup>2</sup>

13. (a) Explain the distribution system for canal irrigation. 10
- (b) Design a regime channel for a discharge of 60 cumecs and silt factor 1.1, using Lacey's theory. 10

14. (a) What are the principal causes and effects of waterlogging in a canal-irrigated land? 10
- (b) Explain Khosla's theory for design of weir on permeable foundation. 10

15. (a) What are rockfill dams and what are their advantages over earthen dams? Draw a neat sketch showing the cross-section of a rock-fill dam. 10
- (b) Write the objectives of river training work. Explain guide banks with neat figure. 10