

<b>CSM – 19/16</b>
<b>Civil Engineering</b>
<b>Paper – II</b>

*Time : 3 hours*

*Full Marks : 300*

*The figures in the right-hand margin indicate marks.*

*Candidates should attempt Q. No. 1 from Section – A and Q. No. 5 from Section – B which are compulsory and three of the remaining questions, selecting at least one from each Section.*

**SECTION – A**

1. Answer any three of the following :
  - (a) (i) What do you mean by high strength concrete ? What are its special features compared to ordinary concrete ? What are the strength determining factors for high strength concrete ? **[3+5+5 = 13]**
  - (ii) What do you mean by ferrocement ? Explain the uses and applications of ferrocement. **[2+5 = 7]**

- (b) What is the significance of bonding in brick work ? Draw sketches and explain the difference between signal Flemish bond and double Flemish bond. **[5+15 = 20]**
- (c) Two triangulation stations A and B 100 km apart have elevations of 140 m and 406 m respectively. A point C, 60 km from A has an elevation of 150 m. Check the intervisibility of A and B and if required, find the height of the signal at B so that, the line of sight clears by 3 m. **[20]**
- (d) Draw the figure of a right hand turnout for a railway track and show different components. **[20]**
2. (a) Draw a PERT network for the followings and find expected mean time, variance and standard deviation of the project : **[20]**

**Activity      Three Time Estimates**

**(Days)**

0-1	2-3-10
0-2	4-5-6
1-2	0-0-0

**Activity      Three Time Estimates  
(Days)**

1 – 3                      6 – 7 – 8

1 – 4                      1 – 5 – 9

2 – 5                      3 – 5 – 19

3 – 4                      0 – 0 – 0

4 – 5                      1 – 3 – 5

(b) (i) Distinguish among total float, free float and independent float.                      **[10]**

(ii) Why does the scheduling function depend on the planning function? Which one must be done first and why?

**[6+4 = 10]**

(c) State and explain the various parameters to be considered for design of energy efficient buildings.                      **[20]**

3. (a) What are the major earth moving operations? Describe the various equipments and processes involved in a concrete batching plant. Describe the salient features of Ready Mix Concrete.                      **[5+10+5 = 20]**

- (b) Calculate the theoretical capacity of a traffic lane with one way traffic flow at a stream speed of 50 kmph. Assume average speed gap between vehicles to follow a relationship,  $S_g = 0.275 Vt$  with a reaction time of 0.75 sec. Assume the average length of vehicle travelling is 6m and hence evaluate the capacity for a 2 lane system. **[20]**
- (c) Describe the stability analysis of an earthen dam. Draw a labelled sketch of an earthen dam. **[15+5 = 20]**
4. (a) Design an irrigation channel of trapezoidal section with side slopes of 0.5 : 1 considering Lacey's regime equation in an alluvial soil carrying a discharge of  $40 \text{ m}^3$ . Lacey's silt factor is 1.10. **[30]**
- (b) The water in an open well was depressed by 2.0 m by pumping during a recuperation and it recuperated by 1.5 m in 90 minutes. Find the diameter of a well to yield 15 litre/sec under a depression of 2m. **[30]**

## SECTION – B

5. Answer any three of the following :
- (a) Draw the sketch of a sludge digestion tank with floating cover and show the different components. Describe the design procedure of a sludge digestion tank. [10+10 = 20]
  - (b) Explain the causes of water logging. How the water logging can be controlled in an open land mass. [10+10 = 20]
  - (c) Explain the advantages and disadvantages of traffic signs. Distinguish between fixed signal and vehicle actuated signals. [10+10 = 20]
  - (d) A town having population of 2.5 lakh is to be supplied with water from a source, 2 km away. The lowest water level in the source is 12 m below the water level of the town. The demand of water is 160 litres/capital/day. If a pump of 250 HP is operated for 1.5 hours and maximum demand is 1.5 times the average demand and the velocity of flow through the rising man is 1.3 m/sec, find the hydraulic gradient and friction factor for the pipe. Assume pump efficiency as 0.75. [20]

6. (a) Design a sewer to serve a population of 50,000. The daily per capita water supply allowance is 150 litres of which 80% finds its way into sewer. The slope available for the sewer is 1 in 600 and the sewer is to be designed to carry 4 times the dry weather flow when running full. What would be the velocity of flow in the sewer when running full? Consider Manning's  $n$  as 0.012. [30]
- (b) Find the dimensions of an oxidation pond and calculate the detention time for treating sewage from a residential colony with population of 10,000. Assume that, the sewage is to be treated at the rate of 140 l/d, the 5 day BOD of sewage is 330 ppm and specific gravity of the organic load is 1.01. [30]
7. (a) 10 lakh litres of raw water is to be treated per day through a rectangular settling tank. If the detention period is 3 hours, the velocity of flow of water is 10 cm/minute and depth of

water and sediment is 5 m, calculate the length of the tank and the width of the tank, if an allowance of 1.5 m is to be made for sediment. [30]

(b) Design a set of rapid sand filter for treatment of water for a population of 40,000. [15]

(c) Explain, briefly, the environmental impact assessment for river valley projects. [15]

8. (a) What do you mean by activated sludge ? Explain the treatment of sewage and industrial wastes through activated sludge process with a labelled sketch. [5+15 = 20]

(b) Explain the principles and design of weirs on a permeable foundation. [20]

(c) Distinguish between flexible pavement and rigid pavement. Explain, briefly, the method of construction of a rigid pavement.

[5+15 = 20]



