CSM—21/23

PART—II/PAPER—VII

CIVIL ENGINEERING

PAPER—II

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Time : 3 Hours

Full Marks : 250

The question paper contains **18 (Eighteen)** *questions in* **GROUP—A, (12)** *and* **GROUP—B, (06)** *together.*

GROUP—A

Candidates to attempt **10** ***(ten)*** *questions within word limit of* **250**. *Each question carries* **15** *marks.*

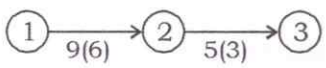
1. What are the different stages in construction? Write down the main resources needed for construction industry.

2. Write down the characteristics of a good timber. What do you mean by seasoning of timber and what is its purpose? Write the different seasoning methods and timber preservatives commonly used.

3. How do you find out the difference in elevation between two points from a single instrument setting point ensuring elimination of major errors by a levelling instrument? Explain with neat sketches. Write five uses of a contour map.

4. Write ten steps in time cost optimization. The table gives the information about various activities of the network shown in the figure. The normal duration of each activity is shown below its activity row, while the crash duration is shown in the bracket.

Activity	Normal duration (days)	Normal cost (₹)	Crash duration (days)	Crash cost (₹)
1–2	9	15,000	6	17,400
2–3	5	10,000	3	11,000



The project overhead costs are ₹750 per day. Determine *(a)* direct cost duration relationship and *(b)* the corresponding least cost plan.

5. How do you decide the alignment of a new road? List the factors and discuss with respect to normal topography and hilly regions.

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6. Write short notes on 'Timing of an isolated traffic signal at a road intersection' and 'Design of signals'.

   A pre-timed four-phase signal has critical lane flow rate for the first three phases as 200, 187 and 210 vehicles per hour with saturation flow rate of 1800 vehicles per hour per lane for all phases. The lost time is given as 4 seconds for each phase. If the cycle length is 60 seconds, what is the effective green time (in second) for the fourth phase?

7. Define Duty, Delta, Base period and show their relationship. Write down the factors on which duty depends. Show a layout of a canal system and write five points each for improving duty of water and precautions in handling irrigation supplies.

8. Discuss the elementary profile of a gravity dam. Find principal and shear stresses near the toe of the dam. Distinguish between a low and high gravity dam.

9. Discuss on 'mass curve in fixing reservoir capacity' and 'Muskingum method of flood routing'.

10. For a new city, a water works system is proposed. Estimate the important kind of drafts for an average water consumption of 250 lpcd. Record the required capacities of the major components of the proposed water works system for the city using river as a source of supply. Design the intake conduit and horse power of the lifting pump. Assume your own data where needed.

11. Make an item-wise comparison (minimum fifteen points) of slow sand and rapid gravity filters and show it in a tabular form.

12. What are the details that constitute an environmental impact assessment? Write five positive and negative impacts each of a river valley project (only points).

GROUP—B

Candidates to attempt **05** ***(five)*** *questions within word limit of* **300**.
Each question carries **20** *marks.*

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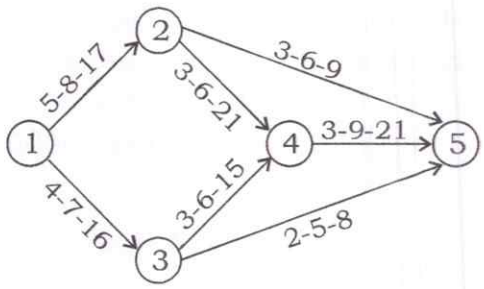
13. Define float and slack in a project network diagram. Discuss different type of floats and slacks with their significance. How do you determine critical path of a network?

The figure shows the network for a construction project with the three time estimates (in days) of each activity marked. Determine the probability of completing the project in 35 days. The standard normal distribution function values may be referred as given below.

Standard Normal Distribution Function	
Z (+)	Probability (Pr)(%)
1·0	84·13
1·1	86·43
1·5	93·32
1·6	94·52
1·7	95·54
1·8	96·41



14. Explain with figures the principle of triangulation survey and its various uses. What is the role of satellite stations in triangulation survey and how are the angle readings at satellite stations reduced to the centre?

15. What is the mathematical model for flexible pavement design by IRC? Write down the procedure for flexible pavement design by IRC approach.

A pavement designer has arrived at a design traffic of 100 million standard axles for a newly developing NH as per IRC : 37 guidelines using the following data :

Design life = 15 years, Commercial vehicle count before pavement construction = 4500 Vehicles/day, Annual traffic growth = 8%. What is the vehicle damage factor used in the calculation?

16. What are the different geological formations in study of ground water flow? Define them. For a confined aquifer, find steady radial flow to a well starting from general flow equations with assumptions. Show that steady flow in an extensive confined aquifer does not exist. How can you measure confined aquifer permeability in a field test?

During a recuperation test of a 4 m (diameter) open well, a recuperation of the depression head from 2·5 m to 1·25 m was observed to take place in 90 minutes.

Determine :

(i) Specific capacity per unit well area

(ii) Yield of the well for a safe drawdown of 2·5 m

17. Discuss the factors governing the selection of a particular type of dam. What are the ideal conditions for selection of a dam site?

18. What is the objective of sludge digestion in sewage treatment? Discuss the different stages in sludge processing and factors offering sludge digestion. Taking your own data, design numerically a digestion tank for a population of 40000.

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