CSM—10/23

PART—II/PAPER—VI

AGRICULTURAL ENGINEERING

PAPER—I

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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. *(a)* What do you mean by offsets? What are the classification of offsets?

(b) What are the methods of traversing to determine the directions of survey lines? Explain with sketches.

2. *(a)* What are the operations involved in plane table surveying?

(b) The bearings of the sides of a traverse *ABCDE* are as follows :

Side	Fore Bearing	Back Bearing
AB	107°15′	287°15′
BC	22°0′	202°0′
CD	281°30′	101°30′
DE	189°15′	9°15′
EA	124°45′	304°45′

Compute the interior angles of the traverse.

3. *(a)* What are the methods of earth work computation in land levelling design?

(b) Explain various methods of land levelling design.

4. *(a)* What are the various types of flow in channels depending on variations with respect to space and time?

(b) What is the phenomena of hydraulic jump and explain the types of jumps in rectangular channels based on the values of Froude number?

5. *(a)* What are the different types of soil water?

(b) Explain the laws governing saturated movement of water through soils.

6. *(a)* What are the components of total soil water potential? Explain.

(b) What are the indirect methods of determination of soil moisture content?

7. *(a)* Explain the terms evapotranspiration, potential evapotranspiration, reference crop ET and consumptive use.

(b) What are the methods of estimation of evapotranspiration?

8. *(a)* What do you mean by irrigation scheduling? What are the various basis for scheduling irrigation?

(b) Explain various irrigation efficiencies. Give formulae.

9. *(a)* What are the advantages of lining irrigation canals? Name some lining materials.

(b) Compute the mean velocity and discharge for a depth of flow of 0·30 m from a lined trapezoidal channel of 0·6 m wide and side slope of 1·5 horizontal : 1 vertical. The Manning's roughness (n) is 0·012 and the bed slope is 0·0003.

10. *(a)* What is cavitation? How does it affect the performance of a pumping system?

(b) Explain the criteria and procedures for selection of irrigation pumps.

11. *(a)* Runoff water from the watershed enters into a drainage area for 5 hours at the rate of 24 m^3/s. The total rainfall during a 24-hour period is 10 cm and infiltration during the same period is 2 cm. If the total drainage area is 500 ha and the crop can tolerate a ponding of 14 cm, calculate the drainage coefficient of the land.

(b) What is surface drainage? Explain the steps in surface drainage design in elaborate way.

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12. *(a)* What is bio drainage? How is it better than conventional drainage methods?

(b) Define drainage and explain various types of drainage patterns along with suitable figures.

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GROUP—B

Candidates to attempt **05** ***(five)*** *questions within word limit of* **300**.

Each question carries **20** *marks.*

13. *(a)* What do you mean by well interference? What are its applications?

(b) Briefly explain the steps in designing a tube well.

14. *(a)* What are the methods of estimation of rainfall erosivity factor?

(b) Explain the components of the Universal Soil Loss Equation (USLE) in estimating soil loss. What are the limitations of using the USLE in watershed management?

15. *(a)* Describe various factors affecting the shape of grassed waterways. Parabolic shape of grassed waterways is the most suitable shape. Justify it.

(b) Design a parabolic-shaped grassed waterway to carry the peak flow of 6 m^3/s on a 1% slope on erodible sandy soil. The waterway must have good grass cover and a permissible flow velocity of 1·5 m/s can be allowed. Assume the value of Manning's coefficient as 0·034.

16. *(a)* Explain the concept of integrated watershed development.

(b) How do remote sensing and GIS contribute to watershed management? Discuss their role in enhancing decision-making for soil and water conservation.

17. *(a)* Explain the types and components of farm ponds.

(b) Explain the SCS Curve Number (CN) method for estimating runoff in a watershed. What factors influence the CN value and runoff estimation?

18. *(a)* What are the points to be considered in identifying the location of a farmstead?

(b) Explain the fundamental requirements of a poultry house.

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