CSM—10/22

AGRICULTURAL ENGINEERING

PAPER—I

Time : 3 Hours

Full Marks : 250

The figures in the right-hand margin indicate marks.

Candidates should attempt ***any*** **10** ***(ten)*** *questions of* **GROUP—A** *with word limit of 250 words and should attempt* ***any*** **5** ***(five)*** *questions from* **GROUP—B** *with word limit of 300 words.*

Candidate must not write on this margin.

GROUP—A

Answer *any* **ten** of the following questions in which Q. No. 1 is compulsory :

1. *(a)* Write the different methods of levelling with neat sketch. 5

(b) The following consecutive readings were taken with a dumpy level along a chain line at a common interval of 15 m. The first reading was at chainage of 165 m where the Reduced Level (RL) is 98·085. The instrument was shifted after the fourth and ninth readings. Find the RL of all the points by any one of the method and apply the usual checks.

3·150, 2·245, 1·125, 0·860, 3·125, 2·760, 1·835, 1·470, 1·965, 1·225, 2·390 and 3·035 m 10

2. *(a)* Describe about the function and components of prismatic compass with neat sketch. 5

(b) The following are the observed bearings of the lines of a traverse *ABCDEA* with a compass in a place where local attraction was suspected and find the correct bearings of the lines. 10

Line	FB	BB
AB	191°45′	13°0′
BC	39°30′	222°30′
CD	22°15′	200°30′
DE	242°45′	62°45′
EA	330°15′	147°45′

3. *(a)* Write about the classification of chain surveying, brief about the accessories required for chain surveying. 5

(b) Explain the area calculation procedure by different methods using plain table surveying with neat sketch. 10

4. *(a)* Write about the temporary adjustment of dumpy level. 5

(b) The ground level along the center line of the road is given below :

Chainage (m)	0	50	100	150	200	250	300
GL (m)	117·50	116·25	115·95	116·65	117·20	117·85	115·75

It is proposed that the formation level RL 115·00 should be kept constant of starting from the chainage 'zero'. The formation width of the road is 8 m and the side slope 1 : 1. The ground is level transverse to the center line. Compute the volume of earthwork. 10

5. *(a)* Classify the open channel flow and write the relationship among Chezy's formula, Manning's formula and Darcy–Weisbach formula. 5

(b) Explain about the hydraulic jump and types of flows based on Froude number. 10

6. *(a)* Write short notes on the following : 5

(i) Field capacity

(ii) Wilting Point

(iii) Available water content

(iv) Maximum available soil moisture deficiency

(v) Moisture equivalent

(b) Write about the different soil moisture measuring methods. 10

7. *(a)* Brief about the different irrigation efficiencies with formulae. 5

(b) Explain the steps involved in designing the trapezoidal open channel. 10

8. *(a)* What do you mean by lining of channel? Discuss about the types of canal lining used for channel. 5

(b) Explain about the irrigation methods and discuss about the factors affecting selection of methods. 10

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9. *(a)* Explain about the underground pipeline system with components. 5

(b) A pump lifts 93600 lph against a total head of 21 m. Compute the water horsepower. If the pump has an efficiency of 72%, what size of prime mover is required to operate the pump? If a directly driven electric motor having efficiency of 80% is used to operate the pump, compute the cost of electrical energy in a month of 30 days. The pump is operated for 12 hours daily for 30 days. The cost of electrical energy is, say, 75 paise per unit. 10

10. *(a)* What is waterlogging? Explain the adverse effect of waterlogging. 5

(b) Explain the surface and subsurface drainage methods with suitable sketch. 10

11. *(a)* Write about the following : 5

(i) Drainage coefficient

(ii) Leaching requirement

(iii) Drainage porosity

(iv) Hooghoudt's equation

(v) Transmissivity

(b) Explain about the soil reclamation methods for different types of problem soils. 10

12. *(a)* Determine the size of a tile at the outlet of a 6-hectare drainage system, if the drainage coefficient is 1 cm and the tile grade is 0·3%. Assume rugosity coefficient for the tile drain materials as 0·011. 5

(b) Explain about the layout of tile drains with neat sketch. 10

GROUP—B

Answer *any* **five** of the following questions in which Q. No. 13 is compulsory :

13. *(a)* What is aquifer? Write the types and properties of aquifer. 8

(b) Explain about various runoff estimation methods. 12

14. *(a)* Explain briefly about the different types of wells and suitable location for construction. 8

(b) Explain about groundwater investigation methods. 12

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15. *(a)* Explain permanent gully control structures with neat sketch. 8

(b) What is soil loss? Discuss about the estimation of soil loss using USLE equation. 12

16. *(a)* Explain the steps involved in designing of farm pond, uses of farm pond and percolation pond. 8

(b) Explain the roles of RS and GIS in watershed planning, development and evaluation. 12

17. *(a)* Write about the land capability classification. 8

(b) Discuss about the soil erosion control measures for plain and hilly areas with sketch. 12

18. *(a)* Explain about the analysis of bearing capacity of soil. 8

(b) Explain different types of roofs with neat sketch. 12

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