AGRICULTURAL ENGINEERING

120002

Time : 3 hours | *Full Marks* : 200

Instructions :

(1) Answer all questions following the directions.

(2) The figures in the right-hand margin indicate full marks for the questions.

1. *(a)* Describe the on-site and off-site impacts of soil erosion. 4

(b) Compare the differences between water and wind erosion in terms of sediment transport. 6

(c) Discuss the main reasons for the high rates of soil erosion in some regions and low in others. 6

(d) Describe factors affecting soil erodibility. 4

2. *(a)* Discuss the strategies of wind erosion management. 5

(b) Describe the benefits of windbreaks to crop and livestock production as well as environmental quality. 5

(c) Describe in brief about stream bank erosion. 5

(d) Describe each term of the sediment continuity equation. 5

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3. *(a)* Discuss the differences among inter-cropping, contour cropping, and strip cropping in relation to design and erosion control effectiveness. 10

(b) What would be the impacts of corn monocropping for biofuel production on soil erosion and long-term soil productivity? 6

(c) Describe the mechanisms responsible for the reduction of soil erosion by adding animal manure to the soil surface. 4

4. *(a)* Estimate the cut and fill volume of soil for a 150 m terrace with balanced cross-section on a 5% slope if the channel depth is 0·50 m. The freeboard is 0·05 m. 10

(b) The soil loss for a sloping in a given location is 13 Mg ha^{-1}. Determine the slope length and terrace spacing needed to reduce the loss of soil from such a field by 50%, if the USLE factor values are $K = 0 \cdot 15$, $L = 150$ m, $S = 7\%$, $C = 0 \cdot 25$ and $P = 0 \cdot 4$. 10

5. *(a)* Describe different types of terraces. Enlist the types of terraces that are used in mountainous regions. 6

(b) Describe various structures used to control gully erosion. 6

(c) Discuss the effectiveness of the biological methods and the conservation structures when used as soil conservation practices. 8

6. *(a)* Describe the major four irrigation methods. 8

(b) Describe different types of irrigation efficiency. 3

(c) Describe how an irrigation system may fail. 3

(d) In general, pressurized irrigation systems are considered to be more efficient than surface irrigation systems. What are some factors that may decrease the irrigation efficiency of some sprinkler systems to below that of some surface irrigation systems? 6

7. *(a)* Describe four different types of aquifers commonly used for irrigation and give an example of each. 8

(b) Discuss groundwater recharge and discharge components for a basin. 6

(c) What is the reason that aquifer pollution is much more difficult to correct than surface water pollution? 3

(d) What are the primary pollutants from agriculture that have contributed to aquifer pollution? 3

8. *(a)* Mention different methods for pipe flow measurement. 5

(b) Write short notes on (along with the equation for flow measurement) *(i)* pitot tube and *(ii)* cut-throat flume. 6

(c) Calculate the discharge over a triangular notch of angle 80° when the water head over the notch is 0·40 m. Assume standard value of coefficient of discharge. 4

(d) What is flow rating curve? Sketch a shift of flow rating curve. What are the causes of shifts in a flow rating curve? 5

9. *(a)* Give two reasons for installing subsurface drainage in a field and discuss its importance. 4

(b) Discuss the positive and negative environmental aspects of subsurface drainage. 6

(c) Water flows through a 1 m long column at a rate of 2 m/d and the pressure differential from one end of the column to the other is 1 m. Calculate the hydraulic conductivity of the media in the column. What would be the flow rate if the pressure differential was 100 kPa? 3+2

(d) Discuss the parameters influencing the design of *(i)* well diameter and *(ii)* spacing of well. 5

10. *(a)* What is greenhouse? Name some materials used in greenhouse construction. Enlist four maintenance practices carried out on a greenhouse. 1+2+2

(b) Outline the desirable features of a good grain store. 5

(c) State the factors that determine the depth and size of foundation in a farm building. 4

(d) Mention the reasons of treating timber before roofing farm buildings. 3

(e) Give the reasons for placing a polythene sheet on a foundation of farm buildings. 3

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