M.E. (Water Resources & Hydraulic Engineering), Examination 2024

(1st Semester)

IRRIGATION AND AGRONOMY

(Paper - II)

Time : Three Hours | Full Marks : 100

Part – I carries 70 marks and Part – II caries 30 marks.

Part - I

Answer any ***five*** questions from Part - I.

1. a) What are the broad divisions of irrigation schemes?
   b) What are the considerations for selecting the best possible site from among the possible alternative sites?
   c) Explain the term "consumptive use of water".
   d) Define and indicate the significance of the permanent wilting point.
   e) What do you mean by water conveyance efficiency?
   f) How is flow irrigation different from lift irrigation?

   3+3+2+2+2+2 = 14

2. a) Define (i) time factor and (ii) suitability of water for irrigation soil.
   b) Describe the volumetric method and velocity area method of water flow measurement. State the precautions to be taken during the measurement.
   c) Differentiate between field water storage efficiency and water distribution efficiency.
   d) Differentiate between weir and barrage.

   3+6+3+2 = 14

3. a) What are the basic requirements of agricultural production and explain the importance of water for irrigation?
   b) Derive a relationship between duty and delta for a given base period.
   c) What are the factors affecting duty?
   d) What are the major steps to be taken in the preparation of a sound and economical irrigation project?

   $3+3\frac{1}{2}+3\frac{1}{2}+4 = 14$

4. a) What are the factors affecting the consumptive use of water?
   b) Prove that the depth of water stored in the root zone in filling the soil upto field capacity is given by $\frac{d.\gamma_s.F_c}{\gamma_w}$ (in meters). Assume that the area of the soil is 1 m^2, depth of the root zone is "d" meters, Unit weight of soil = γ_s kg/m^3, field capacity of the soil is F_c.
   c) What is meant by "Free water"?
   d) What are the considerations for selecting the best possible site from among the possible alternative sites?

   3+5+2+4 = 14

5. a) The base period, intensity of irrigation and duty of water of various cops under a canal system are given in the table below. Find the reservoir capacity if the canal losses are 20% and reservoir losses are 15%. The total Cultivable command area is 18,000 hectares.

Crop	Base Period (Days)	Intensity of Irrigation (%)	Duty at the field (hectares/cumec)	Area under the crop (hectares)
Wheat	130	26.0	1950	5200
Sugar Cane	370	30.0	720	6100
Cotton	180	13.5	1630	2700
Rice	120	19.5	750	3900
Vegetables	110	11.0	710	2200

b) Give an example of the perennial system of flow irrigation.
c) Define capillary and gravitational waters. Also, specify their characteristics.
d) What do you mean by full supply coefficient?

8+1+3+2 = 14

6. a) What are the advantages and disadvantages of the float method? State the precautions to be taken during the measurement.
b) What are the advantages and disadvantages of Parshall flume in flow measurement?
c) A soil core was drawn with a core sampler having an inside dimension of 4.9 cm diameter and 15.1 cm length from a field two days after irrigation when the soil water was near field capacity. The weight of the core sampler with fresh soil sample was 1.951 kg and the weight of the same on oven drying was 1.842 kg. The empty core sampler weighed 1.403 kg. Calculate the (i) bulk density of soil, (b) water holding capacity of soil in percent on a volume basis and (c) depth of water held per meter depth of soil.

4+5+5 = 14

7. a) Differentiate between the water meter and current meter.
b) What are the causes of salt efflorescence? Then. briefly discuss the effects of salt efflorescence.
c) Explain the sub-surface irrigation method and check-basin irrigation method.

3+5+6 = 14

8. a) Elaborate the basic physical properties that influence the soil-water relationship.
b) Explain the terms "Effective saturation" and "Air Porosity".
c) Calculate the (i) bulk density, (ii) mass wetness and (iii) volume wetness of soil when a soil core of 9.88 cm diameter and 8.98 cm length weighs 1189.98 gm immediately after sampling and 989.89 gm after oven drying at 108.9 ^{0}C.
d) A soil sample was taken with a core sampler from a field when the soil reached field capacity. The oven-dry soil weighed 1.065 kg. The inside diameter of the core was 7.5 cm and the length was 15 cm. determine the bulk density and apparent specific gravity of the soil.

4+3+4+3 = 14

Part – II

Answer any ***three*** questions from Part - II.

9. a) What is the water requirement of a crop?
   b) What are the factors that are considered for determining the water requirement of a crop?
   c) Write down the factors that influence Water Use Efficiency.

3+4+3 = 10

10. a) Define the term agronomy and describe its importance in agricultural practice
    b) Write short notes on
       (i) Drip irrigation system, (ii) Fertigation system

4+6 = 10

11. a) Define soil structure and soil texture.
    b) Which are the forms by which water is held in soil?
    c) Name two positively and two negatively charged ions that are either attracted to the soil colloids or remain in the soil solution.

4+4+2 = 10

12. a) According to what considerations crops are classified?
    b) What are the broad classifications of field crops?
    c) Give two examples each of cereal and oil seed crops.

3+3+4 = 10

13. a) Define Soil and Water Conservation.
    b) Describe the advantages of soil conservation.

4+6 = 10

14. a) Describe the "different types of soil water" with a sketch.
    b) Write short notes on
       (i) Tensiometer, (ii) Waterlogging

5+5 = 10