M.E. (Water Resources & Hydraulic Engg.) Examination (6 Semester), 2025

(2nd Semester)

IRRIGATION AND AGRONOMY

(Paper - II)

Time : Three Hours | Full Marks : 100

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

Part - I

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

1. a) How does irrigation help to increase crop productivity?
   b) Why is accurate information on the water supply position important for the development of irrigation systems?
   c) What are the basic requirements of agricultural production, and explain the importance of water for irrigation?
   d) Distinguish between major, medium, and minor irrigation projects.
   e) What are the considerations for selecting the best possible site from among the possible alternative sites?

   2+2+3+3+4 = 14

2. a) Is the water table harmful to crops?
   b) Prove that the depth of water stored in the root zone in filling the soil up to field capacity is given by $d.\gamma_s.F_c/\gamma_w$ (in meters). Assume that the area of the soil is 1 m^2, the depth of the root zone is "*d*" meters, the unit weight of soil is γ_s kg/m^3, field capacity of the soil is F_c.
   c) Find out a relation between Duty of Water (D), Base Period (N), and Delta (Δ).
   d) Explain the term "Irrigation need of a crop".

   2+5+5+2= 14

3. a) What is meant by "Free water"?
   b) Arrange column (A) & column (B) properly

Column (A) - *pH* value	Column (B) - Yield
Below 6	Yield declines
6.5 – 7.5	Normal yield
7.5 – 8.5	Best yield
8.5 – 9.0	Special treatment is needed for profitable growth of plant

c) Define hygroscopic and gravitational waters. Also, specify their characteristics.

d) What are the principal causes of waterlogging in a canal-irrigated farm?

e) What are the causes of salt efflorescence?

1+2+5+4+2 = 14

4. a) Identify the following crops as rabi / kharif / overlapping:-
Maize, Gram, Barley, Papaya, Cotton, Til, Peas, Banana, Tobacco, Arhar.

b) Arrange list (I) with the list (II):

List (I) - Crop	List (II) - Water Depth (cm)
Wheat	45
Pulses	30-40
Mustard	75
Sugarcane	100-120
Potato	120
Rice	30

c) Match column (A) with column (B):

Column (A) - Type of crop	Column (B) - Water table depth beyond which crops are not affected due to waterlogging in the alluvial plains region of North India (cm)
Maize	60
Wheat	90
Rice	60
Barley	120

d) Define consumptive use of water. What are the factors affecting the consumptive use of water?

5+3+2+4= 14

5. a) What are the advantages and disadvantages of the float method? State the precautions to be taken during the measurement.

b) Describe the method of measurement of water flow by a horizontal pipe with a suitable sketch.

c) After how many days will you apply water to the soil in order to ensure sufficient irrigation of the given crop if the field capacity of soil is 34%, the permanent wilting point is 15%, the density of the soil is 1.5 gm/cc, the effective depth of the root zone is 72 cm and daily consumptive use of water for the given crop is 13 mm. Assume any other data if required.

4+3+7= 14

6. a) Between a dam and a barrage, what is the difference in their functions?
   b) The CCA for an irrigation canal is 24680 hectares. The intensity of irrigation for wheat is 65% and for rice it is 45%. The total water requirements of the two crops are 36 cm and 120 cm, and their periods of growth are 150 days and 125 days, respectively.
      (i) Determine the outlet discharge from average demand considerations;
      (ii) Also determine the peak demand discharge, assuming that the kor water depths for two crops are 14 cm and 19 cm. And their kor periods are 4 weeks and 2 weeks respectively

3+11 = 14

7. a) Define "Total Porosity" and "Void Ratio".
   b) A soil core was drawn with a core sampler having an inside dimension of 5.2 cm in diameter and 22 cm in length from a field two days after irrigation when the soil water was near field capacity. The weight of the core sampler with a fresh soil sample was 1.95 kg, and the weight of the same on oven drying was 1.59 kg. The empty core sampler weighed 1.57 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.
   c) Explain the sub-surface irrigation method.
   d) What are the factors that should be accounted for preferential choice of different irrigation methods?

3+5+3+3 = 14

Part - II

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

8.a) According to what considerations crops are classified?

b) What are the broad classifications of crops?

c) Give two examples each of cereal and oil seed crops.

3+3+4=10

9.a) What is water requirement of a crop?

b) What are the factors that are considered for determining water requirement of crop?

c) Write down the factors that influence Water Use Efficiency?

3+4+3=10

10. a) Define Soil & Water Conservation

b) Describe the advantage of soil conservation

4+6=10

11. a) Describe the "different type of soil water" with sketch

b) Write short notes on

i) Tensiometer ii) Water Logging

5+5=10

12. a) What is fertigation .

b) Briefly Describe the different component of Drip Irrigation & Fertigation

2+8=10