M.E. (Water Resources & Hydraulic Engineering) Exam. (6 Semester), 2018

(2^{nd} 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) Define irrigation and explain its necessity in a tropical country like India
   b) What are the benefits and disadvantages of assured irrigation?
   c) How is the Flow Irrigation different from the Lift Irrigation?

$(2+3)+\left(4+2\frac{1}{2}\right)+2\frac{1}{2}=14$

2. 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) Differentiate between weir and barrage.
   e) Match column (A) with column (B):

Location	*Average Annual Rainfall (mm)*
Column (A)	Column (B)
Mawsynram	277
Cherrapunjee	11,870
Barmer	3180
Jaisalmer	150
Andaman and Nicobar Islands	11,780
Darjeeling	3430

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

3. a) Define consumptive use of water.
   b) What are the factors affecting the consumptive use of water.
   c) How will you determine consumptive use of water in the field?
   d) Explain the Blaney-Criddle formula.
   e) Name two eight month crops.

2+5+4+2+1= 14

4. a) What are the standards for 1st class water which is excellent for good irrigation?

   b) Prove that the depth of water stored in the root zone in filling the soil upto field capacity is given by $\frac{d\gamma_s F_c}{\rho_w}$ (in meters). Assume that the area of the soil is 9.81 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) Arrange list (I) with list (II):

Crop	Water Depth *(cm)*
Peas	30
Wheat	30-40
Mustard	45
Potato	120
Sugarcane	100-120
Pulses	50

4+2+5+3 = 14

5. a) Identify the following crops as Rabi / Kharif / Overlapping:-
   Ground nut, Gram, Mustard, Tobacco, Cotton, Arhar, Millet, Burley

   b) Differentiate between productivity scheme and protective irrigation scheme.

   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 the soil is 28.32%, permanent wilting point is 13.88% and the density of the soil is 1.388 gm/cc. The effective depth of the root zone is 71.38 cm and daily consumptive use of water for the given crop is 13.88 mm. Assume any other data if required.

4+2+8=14

6. a) Explain furrow irrigation method and check basin irrigation method.

   b) What are the major steps to be taken in preparation of a sound and economical irrigation project?

   c) Define full supply coefficient.

   d) Compare the duties of the following two irrigation systems and state which one is more economical. It is given that CCA is 80% of the GCA.

Data	1st System	2nd System
GCA	4530 ha	810 ha
Intensity of irrigation	50%	70%
Base Period	130 days	120 days
Mean Discharge (Q)	4 cumec	1 cumec

5+3+1+5= 14

7. a) Define bulk density, particle density and porosity of soils. How are these worked out?
   b) What is meant by saturation capacity? How is it determined?
   c) Derive a relationship between mass wetness and volume wetness.
   d) Calculate the soil water content on weight basis of a wheat field just before irrigation when the fresh soil sample in an alluminium box weighs 82.85 gm which on oven drying at 105^{o}C weighs 76.49 gm. The weight of the empty box is 32.55 gm.

4+3+3+4 = 14

8. a) Enumerate the volumetric method and volume metering method.
   b) What are differences between water meter and current meter?
   c) What are differences between free flow and submerged flow?
   d) State principles and procedure of water flow measurement by using cut throat flume.

5+2+2+5= 14

Part - II

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

9. a) What are the broad classifications of crops?
   b) How crop can be classified with respect to place of origin? Give examples.
   c) How many layers are there in soil profile? Explain.

3+3+4= 10

10. a) What are the factors that are considered for determining water requirement of crop?
    b) The sugarcane crop requires higher amount of water than wheat – True/False
    c) Give two examples each of cereal and oil seed crops.
    d) Name two crops that have high water requirement?

3+1+4+2

11. a) Igneous rocks are formed by cooling, hardening and _____ of various lavas.
    b) Rice is grown mainly in the _____ season.
    c) Which of the layers are not relevant from the agricultural point of view?
    d) Hygroscopic soil water is held at what atmospheric pressure.
    e) What type of irrigation method is preferred under windy conditions?
    f) What are the factors that should be accounted for preferential choice of different irrigation methods?

1+1+2+1+1+4= 10

12. a) What is cover crop and write three advantages of cover crops?
    b) Why is mulching advantageous?
    c) What is crop rotation and what are its socioeconomic effects?

4+2+4=10

13. a) What are the advantages and disadvantages of crop rotation?
    b) What are the socioeconomic effects of bench Terraces?
    c) Contour tillage is practiced to reduce soil _____ and surface _____.

6+3+1=10