

**M.E. (Water Resources & Hydraulic Engineering) Exam. (6 Semester), 2019**  
(2<sup>nd</sup> Semester)

**IRRIGATION AND AGRONOMY**

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) Why irrigation is necessary for a crop production?  
b) List a few benefits of irrigation?  
c) What are the major steps to be taken in preparation of a sound and economical irrigation project?  
d) What are the considerations for selecting the best possible site from among the possible alternative sites?  

3+3+4+4= 14
2. a) What are the standards for 3<sup>rd</sup> class water which is unfit for irrigation?  
b) What is meant by hygroscopic water? Also mention the factors on which it depends.  
c) Define (i) base period, (ii) capacity factor, (iii) nominal duty and (iv) full supply coefficient.  

3+4+7 = 14
3. a) Define and indicate the significance of the field capacity and PWP.  
b) Explain the term “consumptive use of water”.  
c) Mention the empirical formula for estimating the monthly consumptive use of water indicating clearly the notations used in the formula.  
d) Find out the particle density of a soil from the following data:  
(i) Weight of an empty 100 cm<sup>3</sup> pycnometer is 35 gm  
(ii) Weight of pycnometer and oven dry soil is 53 gm  
(iii) Weight of the pycnometer with soil and water making the total volume to 100 cm<sup>3</sup> is 153.35 gm  
(iv) Weight of the pycnometer filled with 100 cc soil is 135 gm  
(v) Density of water is 1 gm/cm<sup>3</sup>.  

4+2+3+5= 14
4. a) What are the advantages and disadvantages of Parshall flume in flow measurement?  
b) Describe the method of measurement of water flow by a horizontal pipe with a suitable sketch. Give the formula for measurement of the flow.

- c) A farmer wants to irrigate 2 ha of wheat field to a depth of 5 cm in 4 days with a pump working 8 hours a day to lift water from a nearby river. What should be the capacity of the pump in litres per second?
- d) Differentiate between water meter and current meter.

$$4 + 4 + 4 + 2 = 14$$

5. a) What do you mean by free water?
- b) The CCA for a distributary is 16000 hectares. The intensity of irrigation for wheat is 45% and for rice is 25%. If the total water requirements of the two crops are 37 cm and 122 cm and their periods of growth are 160 days and 135 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

$$2 + 12 = 14$$

6. a) Draw a triangular diagram for deciding soil textural classes as proposed by International Soil Science Society (ISSS).
- b) A soil core was drawn with a core sampler having an inside dimension of 6.7 cm diameter and 16.7 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 1.76 kg and the weight of the same on oven drying was 1.67 kg. The empty core sampler weighed 1.176 kg. Calculate the (i) bulk density of soil, (b) water holding capacity of soil in percent on volume basis and (c) depth of water held per meter depth of soil.
- c) What is meant by soil wetness? How is it determined?

$$4 + 6 + 4 = 14$$

7. a) Between a dam and barrage what is the difference in their functions?
- b) Explain furrow irrigation method.
- c) What are the adverse effects of water logging on agriculture?
- d) What are the principal causes of water-logging in a canal irrigated farm?

$$3 + 3 + 4 + 4 = 14$$

## Part - II

Answer any *three* questions from Part - II.

8. a) Which conditions are preferable for drip and sprinkler irrigation system?  
b) What is water requirement of a crop?  
c) What are the factors that are considered for determining water requirement of crop?  
d) How can you agronomically manipulate water use efficiency of crops?  
e) Name two crops that have high water requirement?

2+1+3+3+1= 10

9. a) List some primary, secondary and minor elements that are required for plant?  
b) Which nutrients are derived from the atmosphere by plants?  
c) What are the three processes by which plant uptake nutrients from soil?  
d) Which are the nutrient elements that are taken up in anionic form?

3+2+3+2= 10

10. a) Define soil structure and soil texture.  
b) What is soil productivity and soil fertility?  
c) Name the soil moisture constants  
d) Calculate the available water content if the water content at field capacity is 69% and the water content at permanent wilting point is 11%.

3+3+2+2= 10

11. a) Name the three groups under which crops are broadly classified.  
b) Give two examples each of pulses, beverages, fibre and drug crops.  
c) Give some examples of C<sub>3</sub>, C<sub>4</sub> plants and crops that follow CAM pathway.

3+4+3 = 10

12. a) What are the factors that should be accounted for preferential choice of different irrigation methods?  
b) What irrigation method would you recommend for high value crops?  
c) What are the disadvantages of drip and sprinkler irrigation structures?  
d) Which is the best irrigation method for irrigating row crops?

4+2+ 2+2 = 10