

**AGRICULTURAL AND FOOD ENGINEERING DEPARTMENT  
INDIAN INSTITUTE OF TECHNOLOGY, KHARAGPUR**

Date of Examination 17/2/2014 (AN)

Marks: 30

Time: 2 hours

Midterm Spring Semester 2013-14

Course: M. Tech. (Land & Water Resources Engg.)

Subject No: AG60104

Subject Name: On Farm Water Management

No. of Students: 16

**Make necessary assumptions.**

---

**Question 1**

- a. Describe utility of tensiometer in irrigation scheduling?
- b. What is irrigation and describe its advantages and disadvantages?
- c. What is lysimeter? Write a water balance equation for the same?
- d. What is deficit irrigation and how it may help in increasing water productivity?
- e. What are different surface irrigation methods and how do they differ from each other?

(5)

**Question 2**

- a. A watercourse has a culturable command area of 100 ha. The intensity of irrigation during kharif and rabi seasons is 60 and 50%, and duty at its head is 60 and 50 ha/cumec, respectively. Determine the discharge required at the head of watercourse?
- b. Develop a relationship between volume wetness, mass wetness, bulk density and water density?
- c. Soil moisture measurements of 1 m deep profile taken using Neutron probe at an interval of 25 cm were 15.2, 18.5, 20.2 and 30.5% prior to irrigation and 33.1, 32.2, 33.0 and 32.5%, after an irrigation event, respectively. The moisture content of the profile at field capacity and permanent wilting point is 32% and 12% respectively. The crop has effective rootzone depth of 100 cm and required to be irrigated at 50% of MAD. Determine the following:
  1. Equivalent water depth in profile prior to irrigation and after irrigation
  2. TAW and RAW for the crop
  3. Irrigation requirement, deep percolation ratio, application efficiency and water requirement efficiency?

(3+3+4)

**Question 3**

- a. The following cumulative intake functions represents conditions during the furrow irrigation where  $Z$  is the cumulative infiltration in  $m^3/m^2$  and  $t$  is the intake opportunity time in minutes

$$Z = 0.0071 t^{0.222} + 0.0003 t$$

During the irrigation, flow advanced to the end of the field in 100 min and then ran off for a time before the inflow was shutoff. Following cutoff, the recession was instantaneous. If the irrigator wished to apply 5 cm to the lower end of the field, when should he have shut off the inflow? Also determine irrigation depth at upstream end of the field?

- b. What is production function and discuss its utility in irrigation management?
- c. Explain assumptions for estimation of recession and depletion phases in border irrigation.

(5+2+3)