

MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE  
SEMESTER END EXAMINATION

B. Tech. (Agril. Engineering)

Semester : VI (Old) Academic Year : 2013-14  
Course No : IDE 363 Title : Advanced Irrigation System Design  
Credits : 3(2+1)  
Day & Date : 30-4-2014 Time : 9.00 to 12.00 Max. Marks : 80

- Note:
1. Solve ANY FIVE questions, from SECTION "A".
  2. All questions from SECTION "B" are compulsory.
  3. All questions carry equal marks.
  4. Draw neat diagrams wherever necessary.
  5. Make appropriate assumptions if required.

SECTION "A"

- Q.1 a) A furrow having length of 90 m and spaced at 75 cm is irrigated by stream of (4)  
initial discharge of 2 lps. The stream size was reduced to 0.5 lps when initial  
stream reached at the end of furrow after 50 min. Find the average depth of  
irrigation, if cut back stream is continued for 1 hour.  
b) Classify irrigation methods. (3)  
c) Write adaptability and limitations of check basin method of irrigation. (3)
- Q.2 a) Derive an equation for advance of water front in border by Parker's and (5)  
Israelson's approach.  
b) Explain in detail different types of irrigation efficiencies with appropriate (5)  
formulae.
- Q.3 a) Describe different basic variables involved in design of irrigation methods. (5)  
b) Explain the design considerations for furrow irrigation method.
- Q.4 a) Describe all components of sprinkler irrigation system and draw neat layout (5)  
showing these components.  
b) Determine the discharge in lps for a sprinkler operating at  $2.8 \text{ kg/cm}^2$  and (5)  
having 4 mm x 2.8 mm diameter nozzles with discharge coefficient of 0.90.
- Q.5 a) State the equation and write the procedure for determination of uniformity (5)  
coefficient developed by Christiansen.  
b) Determine the required capacity of sprinkler system to apply water at the rate (5)  
of 1.25 cm/hr. Two 186 meters long sprinkler lines are required. 16 sprinklers  
are spaced at 12 meter intervals on each line. The spacing between lines is 18  
meters.
- Q.6 a) Describe in detail the different types of emitters according to their (5)  
characteristics.  
b) Enlist different fertilizer applicators and discuss the working of any one of (5)  
them.
- Q.7 a) What are the causes of clogging of emitters and laterals in drip irrigation (4)

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- system?
- b) Write short notes on (Any Two)
    - i) Chemigation
    - ii) Gravel/ Sand media filters
    - iii) Operation of twin nozzle rotating sprinkle head

SECTION "B"

- Q. 8 State whether true or false
- 1 The discharge of drip emitters usually ranges from 2-10 litres/sec.
  - 2 Land leveling is essential for irrigation with drip irrigation system
  - 3 The major factor influencing the efficiency of well designed sprinkler irrigation system is wind velocity.
  - 4 In case of hilly terrain the lateral should be laid along the contour.
  - 5 Gravel filters/sand filters are used principally for filtering out heavy loads of very fine sands and organic matter.
  - 6 In check basin irrigation sandy and sandy loam soils permit the use of large size basins.
  - 7 The recommended safe limit of land slope for border in clay to clay loam soil is 0.05 to 0.20 %.
  - 8 Furrow irrigation reduces the labour requirements in land preparation and irrigation.
  - 9 Corrugation irrigation is the most suitable in loamy soils.
  - 10 The border method of irrigation is adopted to soils having moderately low to moderately high infiltration rates

- Q.9 Fill in the Blanks
- 1 The minimum satisfactory value of uniformity coefficient in sprinkler irrigation under normal condition of pressure and wind velocity is \_\_\_\_\_.
  - 2 For fully laminar flow the emitters discharge exponent,  $x =$  \_\_\_\_\_.
  - 3 Venturi is device, which creates \_\_\_\_\_ pressure.
  - 4 The pressure head in a sprinkler system is converted into velocity head at \_\_\_\_\_.
  - 5 Sprinkler irrigation system is suitable for almost all crops except \_\_\_\_\_.
  - 6 \_\_\_\_\_ plant is commonly used as the indicator for permanent wilting percentage.
  - 7 The size of the furrow stream usually varies from \_\_\_\_\_ to \_\_\_\_\_ litres per second.
  - 8 One centimeter depth of water over an area of one hectare = \_\_\_\_\_ cubic meter.
  - 9 The width of border usually varies from \_\_\_\_\_ to \_\_\_\_\_ m.
  - 10 If index of jet break-up (Pd) is greater than \_\_\_\_\_ the condition of drop size is good.

- Q.10 Define the following
- |   |                               |   |                 |
|---|-------------------------------|---|-----------------|
| 1 | Infiltration rate             | 4 | Fertigation     |
| 2 | Infiltration Opportunity time | 5 | Available water |
| 3 | Recession flow                |   |                 |

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