



## ASSIGNMENT NO. 5

### Sprinkler Irrigation

1. State the advantages and disadvantages of Sprinkler Irrigation.
2. A field area of  $720 \times 720$  m is to be irrigated using sprinkler irrigation, (Semi Permanent system). Time of irrigation is 5.5 hours and irrigation interval is 5.0 days. The working hours of the pump are 17 hours. The sprinkler discharge is 0.6 lit/sec, operating head is 3 bar. spacing between sprinklers is 15 m, and spacing between laterals is 12 m. The pump is at the middle.
  - i- Determine the number of laterals required for this area, the lateral diameter.
  - ii- The diameters of the secondary and main pipelines then and calculate the pumping requirements ( $Q$ ,  $h_p$  and HP).
  - iii- Draw full plan (with reasonable scale) for sprinkler irrigation system and show all details.
3. A field of  $600\text{m} \times 600$  m to be irrigated using permanent sprinkler irrigation system, the following data may be used for the design of the irrigation system:

Plant consumption: 10 mm/day, root zone depth: 75 cm,  $\epsilon$ : 50 %  
Water contents at field capacity and wilting point are 30 % and 15 % respectively.  
The working hours of the pump are 18 hr/day. The sprinkler discharge is 0.5 lit/sec, operating head is 2.5 bar, spacing between sprinklers is 12 m, and spacing between laterals is 12 m. The pump is at the corner. Irrigation efficiency: 90 %  
Required:

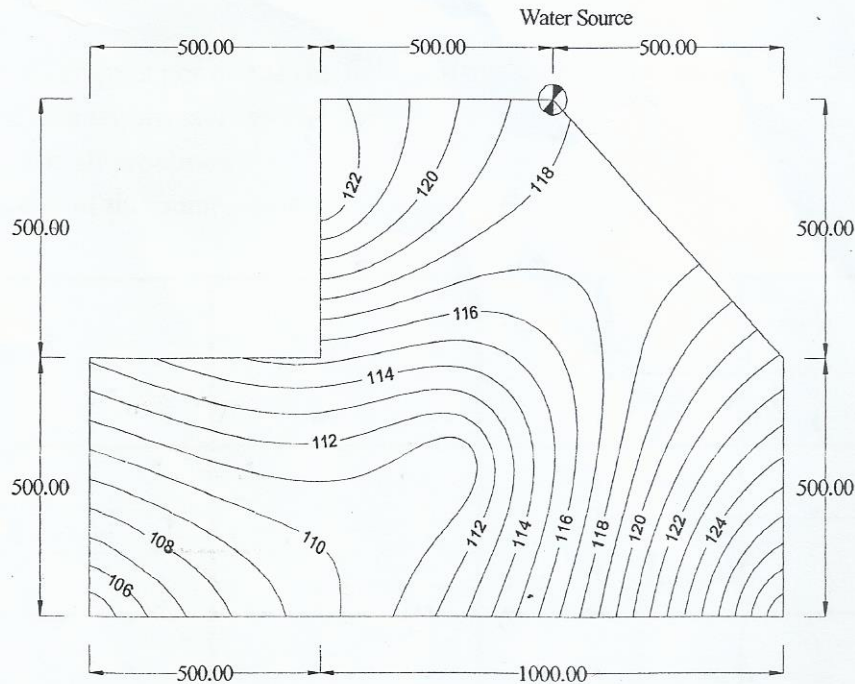
  - i- Design all the pipes then and calculate the pumping requirements ( $Q$ ,  $h_p$  and HP).
  - ii- Draw a sketch (with reasonable scale) for the alignment of pipe network and show all details.
4. A field area of  $660 \times 660$  m is to be irrigated using sprinkler irrigation, (Semi Permanent system). Time of irrigation is 6.0 hours and irrigation interval is 5.0 days. The working hours of the pump are 15 hours. The sprinkler discharge is 0.5 lit/sec, operating head is 2.8 bar, spacing between sprinklers is 15 m, and spacing between laterals is 11 m. The pump is at the middle.
  - i- Determine the number of laterals required for this area, the lateral diameter.
  - ii- The diameters of the secondary and main pipelines then and calculate the pumping requirements ( $Q$ ,  $h_p$  and HP).
  - iii- Draw full plan (with reasonable scale) for sprinkler irrigation system and show all details.
5. The following figure shows a farm to be irrigated using permanent sprinkler irrigation system, the following data may be used for the design of the irrigation system:
  - The field water duty is  $24 \text{ m}^3/\text{fed}/\text{day}$ .
  - Irrigation depth is 23 mm.



- Sprinkler (Rotor 8005-Nozzle 20) discharge is 16.84 lit/min with operating head is 2.5 bars and effective area served is  $15 \times 10$  m.
- Working hours are 16 hr/day.

It is required:

- Design all the pipes then and calculate the pumping requirements ( $Q$ ,  $h_p$  and  $HP$ ).
- Draw a sketch (with reasonable scale) for the alignment of pipe network and show all details.



- A test was conducted to determine the water depth infiltrated from an existing sprinkler irrigation network. 40 cans were arranged in 8 rows and 4 columns to establish the test. The collected water depths in each can are presented in the following table. Determine the coefficient of uniformity.

Can No.	Water Depth (mm)	Can No.	Water Depth (mm)
1	8	21	11.2
2	8.5	22	13.4
3	9	23	12.1
4	10	24	10.3
5	13	25	10.6
6	15	26	9.2
7	12	27	9.4
8	12	28	9.7
9	14	29	8.4
10	10	30	9.1
11	9	31	9.3
12	9	32	10.2
13	11	33	10.3
14	9	34	13.5
15	8	35	9.5
16	8	36	8.9
17	9.5	37	9.3

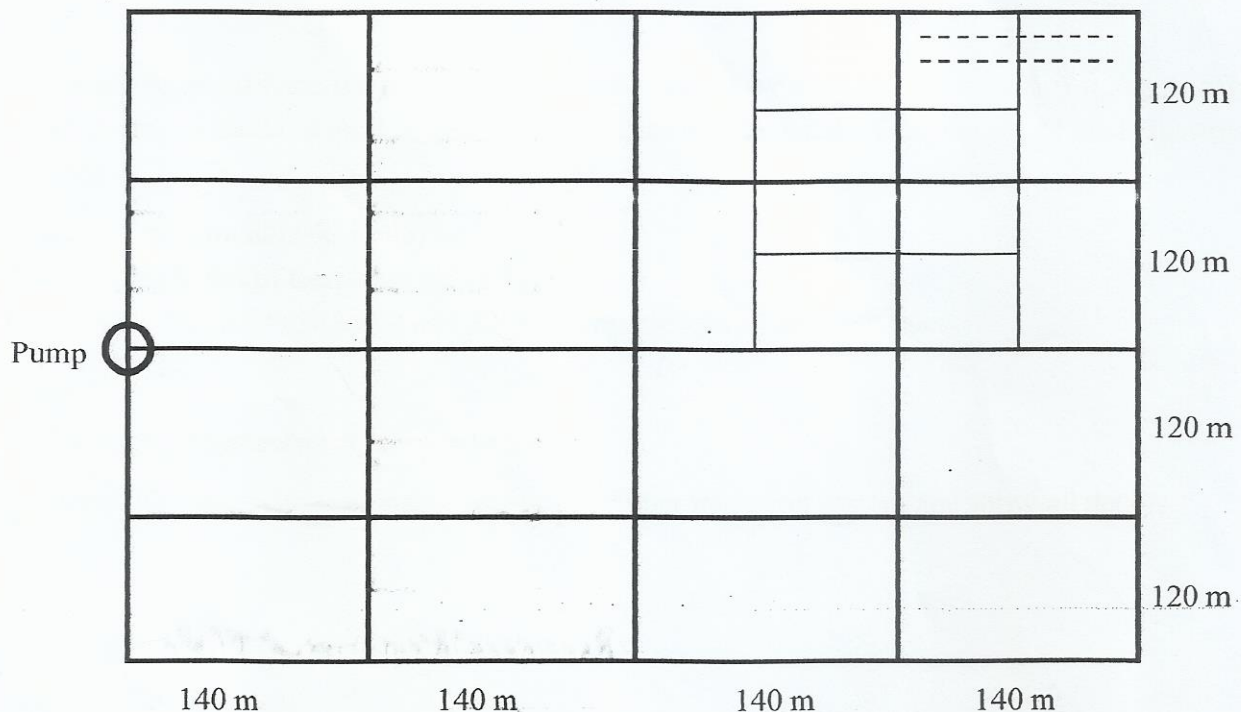
18	9.2	38	9.4
19	9.3	39	9.6
20	8.9	40	9.2

### Drip (Trickle) Irrigation

7. State the advantages and disadvantages of Drip Irrigation.

8. The figure below shows a drip irrigation system. The spacing between trees is 6 x 4 m irrigated using drippers of 8 lit/hr. The types of drippers used are operated on 1.5 bars operating head. Determine:

- The number of drippers per tree if the field is irrigated continuously and the irrigation period is 12 hours. The tree requirement is 160 lit/day.
- The diameters of all pipelines.
- The hours power of the pump station.



9. A farm 1000×1000 m is cultivated by fruit trees distanced 4×4 m as shown in below figure. the following data may be used for the design of the irrigation system:

The tree requirement is 80 lit/day.

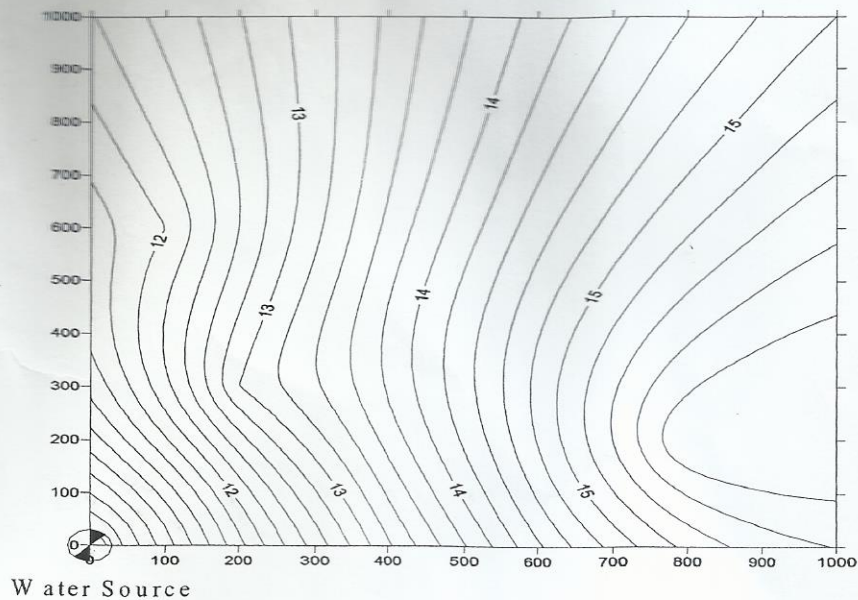
The working hours of the pump are 20 hr/day.

Drippers with 5, 10 lit/hr discharge and 1, 2 bars operating head are available.

It is required:

- Design the pipe network and pump station.
- Draw full plan (with reasonable scale) for dripper irrigation system and show all details.





10. It is required to cultivate the border of a land  $120 \times 120$  m by trees ( $3 \times 3$  m spacing) with a width of 40 m around the land border. the following data may be used for the design of the irrigation system:

The tree requirement is 40 lit/day.

The working hours of the pump are 16 hr/day.

Drippers with 5 lit/hr discharge and 1.5 bars operating head are available.

It is required:

- i- Design the pipe network and pump station.
- ii- Draw full plan (with reasonable scale) for dripper irrigation system and show all details.