A **Reg. No. :** | | | | | | | | | | | | |

Question Paper Code:U6A01

B.E./B.Tech. DEGREE EXAMINATION, APRIL/ MAY 2025

Sixth Semester

Agricultural Engineering

21UAG601– MICRO IRRIGATION SYSTEMS

(Regulations 2021)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Centrifugal pumps transfer energy from _____ CO1-U

   (a) Rotor to fluid (b) Fluid to rotor (c) Draft to rotor (d) Rotor to draft

2. Valves used for throttling is _____ CO1-U

   (a) Butterfly valve (b) Gate Valve (c) Ball Valve (d) Plug Valve

3. Method of irrigation is most suitable for water-scarce regions CO1-U

   (a) Flood irrigation (b)Micro-irrigation (c) Basin irrigation (d) Furrow irrigation

4. Which component is responsible for regulating water pressure in a micro-irrigation system? CO1-U

   (a) Drippers (b) Valves (c) Water tank (d) Main pipeline

5. Primary objective of a drip irrigation system is _____ CO1-U

   (a) Maximize evaporation losses (b) Apply water precisely at the root zone

   c) Flood the entire field (d) Increase soil erosion

6. Common maintenance issue in drip irrigation CO1-U

   (a) Dripper clogging (b) Soil compaction (c) Overhead leaf wetting (d) Wind erosion

7. Fertilizer injection in a sprinkler system is known as: CO2-U

   (a) Hydroponics (b) Fertigation (c) Surface broadcasting (d) Foliar feeding

8. The primary advantage of using fertilizer injection in sprinkler irrigation is: CO2-U

(a) Reduced soil fertility (b) Increased labor cost

(c) Efficient nutrient uptake by plants (d) Water loss due to evaporation

9. Which component is essential in a timer/sensor hybrid irrigation system? CO2-U

(a) pH meter (b)Water flow sensor (c) Light sensor (d) Insect repellent

10. The main advantage of an automated irrigation system? CO2-U

(a) Increased labor cost (b) Precise water management

(c) Reduced crop yield (d) Increased water wastage

PART – B (5 x 2= 10Marks)

11. Differentiate between positive displacement pumps and variable displacement pumps. CO1-U

12. Define Micro-irrigation and list out the types. CO1-U

13. Mention two factors that influence the design of a drip irrigation system. CO2-U

14. Draw a neat sketch of sprinkler irrigation system and label the parts. CO2-U

15. Write down the key components of an IoT-based automated irrigation system. CO2-U

PART – C (5 x 16= 80Marks)

16. (a) Design an irrigation system for a small farm using a submersible pump, and explain how you would select the appropriate pump size, installation depth, and power requirements to ensure efficient water delivery. CO3-App (16)

Or

(b) How you would apply the working principle of a centrifugal pump in designing an irrigation system for a large farm, ensuring optimal flow and pressure for efficient water distribution. CO3-App (16)

17. (a) Describe the types of micro-irrigation systems, highlighting their components and specific applications. CO1-U (16)

Or

(b) Discuss the merits and demerits of micro-irrigation systems with examples from agricultural practices. CO1-U (16)

18. (a) Design a drip irrigation system for a citrus orchard of 1 ha area with length and breadth of 100 m each. Citrus has been planted at a spacing of 5 m ´ 5.5 m. The maximum pan evaporation during summer is 8 mm/day. The other relevant data are given below: CO3-App (16)

Land slope = 0.40 % upward slope from S – N direction,
Water source = A well located at the S–W corner of the field
Soil texture = Sandy loam,
Clay content = 18.4 %, Silt = 22.6 %,
Sand=59.0%, Field capacity = 14.9 %, Wilting point = 8 %,
Bulk density = 1.44 g/cc,
Effective root zone depth = 120 cm, Wetting Percentage = 40 %,
Pan coefficient = 0.7,
Crop coefficient = 0.8

Or

(b) Design a subsurface drip irrigation system for a fruit orchard, and explain how you would apply soil type, water requirements, and system layout to ensure efficient water delivery and minimize evaporation losses. CO3-App (16)

19. (a) Design a sprinkler irrigation system to irrigate 5 ha Wheat crop. CO4-App (16)
Assume: Soil type = silt loam, Infiltration rate at field capacity = 1.25 cm h-1, Water holding capacity = 15 cm m-1, Root zone depth = 1.5 m, Daily consumptive use rate = 6 mm day-1, Sprinkler type = Rotating head.

Or

(b) Determine the uniformity coefficient, Pattern and application efficiencies from the following data obtained from a field test on a square plot bounded by four sprinklers: CO4-App (16)

Sprinkler (S) - 4.76 x 3.2 mm nozzles at 2.8 kg/cm3
Spacing- 16 m x 12 m, Wind- 5 km/hr from south-west, Humidity- 49 percent
Time of test- 2 hour

S	9.4	8.1	7.1	S
8.6	8.1	10.4	10.7	8.8
9.4	9.6	9.6	9.9	9.4
9.9	8.4	9.6	9.1	9.6
S	8.4	7.1	7.3	S

20.	(a)	Design an automation model for a greenhouse irrigation system and explain how sensor-based automation can optimize water usage.	CO5-App	(16)
		Or		
	(b)	Develop a model for a solar-powered automatic irrigation system for remote agricultural fields. Include details about the solar panel setup, energy storage, and irrigation mechanism.	CO5-App	(16)