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

Question Paper Code: U6A01

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2024

Sixth semester

Agricultural Engineering

21UAG601 MICROIRRIGATION SYSTEMS

(Regulation 2021)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Which type of pump is used for aquaculture? CO1-U

   (a) Submersible pumps (b)Centrifugal pumps

   (c) Deep well turbine pumps (d) Air lift pumps

2. What is the term for the pressure at which a liquid transitions into vapor? CO 1 - U

   (a)Atmospheric Pressure (b) Gas Pressure

   (c) Vapour Pressure (d) Suction pressure

3. What type of flow measuring device is suitable for use in rivers and canals? CO 1- U

   (a) Ultrasonic flow meters (b) Electromagnetic flow meters

   (c) Turbine flow meters (d) Notch and venturimeters

4. In which industry are electromagnetic flow meters primarily utilized? CO 1- U

   (a) Pump stations (b) Municipal water supply

   (c) Waste water treatment (d) Irrigation channels

5. National Horticultural Board provides how much subsidy for projects having budget of Rs. 25 lakhs? CO 1- U

   (a) 20% (b) 25% (c) 30% (d) 50%

6. What is the primary objective of automation in irrigation systems? CO 1- U

   (a) To increase water usage (b) To reduce labor costs

   (c) To promote soil erosion (d) To decrease crop yield

7. What is the recommended planting distance for tomato trees in a drip irrigation setup? CO 1- U

(a) 5m x 5m (b)2m x 2m (c) 0.6m x 0.6m (d) 4m x 4m

8. What is the cost of drip irrigation per hectare? CO 1-U

(a)2,47,000 (b) 1,51,500 (c)2,20,500 (d)3,30,500

9. Which type of crop is suitable for sprinkler irrigation among the listed crops? CO 1- U

(a) Gram (b) Banana (c) Sugarcane (d) None of the above.

10. For which sprinkler irrigation system the laterals are portable while the main lines connecting to the water source and pumping plant remain stationary? CO 1- U

(a) Semi permanent system (b) Semi portable system

(c) Portable system (d) Permanent system

PART – B (5 x 2= 10 Marks)

11. Differentiate single-acting and double-acting pump. CO1- U

12. Summarize the function of a pressure-reducing valve and include a labeled diagram showing its parts. CO1- U

13. Generate a block diagram illustrating the functionality of automation in agricultural irrigation systems. CO1- U

14. Calculate the emission uniformity of a drip irrigation system segment employing drip emitters with a coefficient of discharge (kd) of 0.25, an exponent (x) of 0.6, and a coefficient of variation (Cv) of 0.08. Each plant utilizes two emitters. The average pressure is 110 kPa, and the minimum pressure is 80 kPa. CO2-App

15. Illustrate the components of a sprinkler irrigation system. CO1- U

PART – C (5 x 16= 80 Marks)

16. (a) Imagine you own an agricultural field of 10 acres in Sholavanthan, Madurai. There is a channel of the river Vaigai running nearby your field but your field topography is elevated from the channel. Analyze the type of soil and weather conditions prevailing in your field. Explore the two best crops suitable for your location, along with the type of irrigation method and pump you would select for your field. CO 2-App (16)

Or

	(b)	Imagine you are the owner of a thriving aquaculture farm, facing the challenge of selecting the most suitable pump for your operation. Decide which pump you would choose, considering factors such as efficiency, cost-effectiveness, and suitability for aquaculture. Explain the working principle and operational mechanism of your chosen pump, providing a detailed diagram to illustrate its uniqueness. Evaluate the pump's efficiency and discuss common problems associated with its usage.	CO 2-App	(16)
17.	(a)	Contrast the functions and applications of check, butterfly, and solenoid valves, emphasizing their unique characteristics and suitability for diverse agricultural engineering contexts.	CO 1-U	(16)
		Or		
	(b)	Examine the selection criteria, repair procedures, and maintenance strategies for valves in agricultural systems, detailing the factors influencing valve choice, and preventative maintenance measures to ensure optimal performance and longevity.	CO 1-U	(16)
18.	(a)	Describe the key components of a micro-irrigation system, including head equipment and distribution systems, emphasizing the selection criteria for each component.	CO 1-U	(16)
		Or		
	(b)	Provide a detailed analysis of the various types of filters utilized in micro-irrigation systems highlighting their working principles, advantages, and limitations. Include diagrams to illustrate the configuration and operation of these filters within the micro-irrigation system.	CO 1-U	(16)
19.	(a)	Design a drip irrigation system for a 1-hectare grapevine vineyard with dimensions of 80 meters in length and 125 meters in breadth. The grapevines are planted at a spacing of 2 meters by 2.5 meters. The vineyard is located on a land slope with a 0.60% upward slope from the South (S) to the North (N) direction, and the water source is a borewell situated at the South-East (S-E) corner of the field.The relevant data for designing the drip irrigation system are as follows: Crop: Grapevine Soil Texture: Loamy sand Soil Composition: Clay content = 15.0%, Silt = 20.0%, Sand = 65.0%	CO 2-App	(16)

Soil Moisture Parameters: Field capacity = 18.0%, Wilting point = 10.0%
Bulk Density: 1.50 g/cc
Effective Root Zone Depth: 100 cm
Wetting Percentage: 50%
Pan Evaporation (Summer): 7 mm/day
Pan Coefficient: 0.8
Crop Coefficient: 1.0

Or

	(b)	Analyze the comprehensive maintenance protocols for a drip irrigation system, encompassing the upkeep of sand and screen filters, daily, weekly, and monthly maintenance routines, as well as treatments such as chemical, acid, and chlorine treatments. Additionally, evaluate the application methods and criteria for fertilizers and agrochemicals in drip irrigation, including equipment selection and injection techniques, integrating diagrams to illustrate your analysis effectively.	CO2-App	(16)
20.	(a)	Troubleshoot the following problem a) Pump does not prime or develop pressure b) Sprinklers do not turn c) Leakage from coupler or fittings	CO 2-App	(16)

Or

	(b)	Assume the role of an agricultural engineer embarking on a mission to transform irrigation practices. You are tasked with designing, selecting, and maintaining an innovative sprinkler system for a large agricultural landscape. Apply your expertise by outlining the factors influencing your selection of a sprinkler system, creating a visionary design adhering to general rules, and detailing the operation and maintenance strategies for this state-of-the-art system.	CO 2-App	(16)