

23/11/13

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B.E. (Full Time) DEGREE END SEMESTER EXAMINATION, NOV/DEC 2013

AGRICULTURAL AND IRRIGATION ENGINEERING

SEVENTH SEMESTER - (REGULATION 2008)

AI 9405 – IRRIGATION EQUIPMENT DESIGN

19

Time: 3 hours

Marks: 100

Part – A

10 x 2 = 20

1. Answer ALL questions

2. Allowed to use tables and nomograph

1. What do you mean by iso-efficiency curves?
2. State the principle in which air lift pump works.
3. What is cavitation in pump?
4. Differentiate between turbine pumps, mixed flow pump and propeller pump.
5. Calculate the operating pressure in an Orifice type point source emitter, if the discharge is 12 lps and k is 0.62.
6. Write the significance of uniformity coefficient in drip irrigation system.
7. At what rate in cm/hr, would a sprinkler discharging at the rate of 0.95 lps apply water if the sprinkler spacing is 18 m x 24 m?
8. What is perforated type sprinkler system?
9. Under what circumstance non-return and butterfly valves are used in micro irrigation?
10. List the types of Solenoid Valves.

Part - B

5 x 16 = 80

11. (i) Explain sequential operation and partial automation in micro irrigation. (8)
(ii) Describe the list of valves used in micro irrigation and explain any two valves with diagram. (8)
- 12.(a) (i) The centrifugal pump has the following characteristics. Outer diameter of impeller = 800 mm; width of the impeller vane at outlet = 100 mm. Angle of the impeller vanes at outlet = 40 degree. The impeller runs at 550 rpm and delivers $0.98 \text{ m}^3/\text{s}$ under an effective head of 35 m. A 500 kW motor is used to drive the pump. Determine the manometric, mechanical and overall efficiencies of the pump. Assume water enters the impeller vanes radially at inlet. (10)
(ii) Explain the common types of medium and high head indigenous water lift. (6)

(OR)

- (b) (i) A double-acting reciprocating piston pump is pumping water (diameter of the piston 250mm, diameter of piston rod, which is on one side of the piston 50mm, piston stroke 380mm). The suction and discharge heads are 4.5m and 18.6m respectively. Find the work done by the piston during outward stroke. Would the work done change for the inward stroke? (10)
- (ii) Explain the common types of low head indigenous water lift. (6)
- 13.(a) (i) Explain the working principle of jet pump with a neat sketch. (8)
- (ii) Calculate the desired discharge rate of a centrifugal pump to be used by a farmer for the following irrigation schedule. (8)

Season	Crop	Area to be irrigated (ha)	Intensity of Irrigation (cm)	Rotation period (days)	Period of work hrs/day
Kharif	Paddy	1.6	10	15	10
	Cotton	2	10	20	12
Rabi	Wheat	3.2	7.5	12	12
	Cotton	2	7.5	20	12
	Vegetables	1.6	7.5	10	12
Hot Weather	Bajra	0.8	7.5	8	10

(OR)

- (b) (i) Explain the working of submersible pump with a schematic sectional view and compare it with vertical turbine pumps. (10)
- (ii) Explain the criteria and procedure for the selection of irrigation pumps. (6)
- 14.(a) Design a suitable drip irrigation system for an orchard on a nearly flat land with medium heavy soil. The dimensions of the field are 420 m x 160 m. The source of water is a tube well located at the top corner of the farm. The tree spacing is 5 m x 4 m. emitters are spaced 1 m apart in each lateral. The monthly evaporation rate observed in the area is 225 mm. irrigation is to be applied daily. The field is nearly flat and the soil is sandy loam. (16)

(OR)

- (b) (i) State the different type of filters and explain the working principle of Screen filters in Drip system. (8)
- (ii) Explain the working principles of different type of drippers and its specific applications. (8)
- 15(a) A 12 ha field is to be irrigated at a maximum rate of 1 cm/hr with a sprinkler system. The root zone is 90 cm deep. The available moisture holding capacity of the soil is 16.5 cm/m depth. The water application efficiency is 70%. The field is to be irrigated when 45% of the available moisture capacity is depleted. The peak rate of moisture use is 5 mm per

day. Determine the net depth of application per irrigation, depth of water to be pumped in cm, days to cover the field and the area irrigated per day. (12)

(ii) Explain the centre pivot system in sprinkler irrigation with suitable figure. (4)

(OR)

- (b) Design a sprinkler irrigation system for a rectangular 12 ha field to irrigate the entire area with 8 days period. Not more than 14 hours/day are available for moving the pipe and sprinkling. The required depth of irrigation is 6 cm and the water application rate is not to exceed 0.9 cm/hr. A 30 m deep well located in the centre of the field will provide the following discharge – drawdown relationship: 10 lps at 14 m and 18 lps at 23 m. Design the system for an average pressure of 3.5 kg/cm^2 at the sprinkler nozzle. The highest point in the field is 1.35 m above the well site and 1.1 m risers are needed for the sprinklers. Assume pump efficiency as 63% and motor efficiency as 68 %. (16)
