

B. E / B. Tech. (Full Time) DEGREE END SEMESTER EXAMINATIONS APR/MAY 2013

AGRICULTURAL AND IRRIGATION ENGINEERING

SEVENTH SEMESTER – (REGULATION 2008)

AI 9405 IRRIGATION EQUIPMENT DESIGN

TIME: 3 hr

Max Mark: 100

Answer ALL questions

PART – A (10 x 2 = 20 MARKS)

1. Differentiate Positive displacement pump and rotodynamic pump? Under which circumstances these pumps are used?
2. A farmer wishes to have his own pump set for Wheat and Cotton whose irrigated area are 2 ha and 0.4 ha respectively. The intensity of irrigation for both wheat and cotton are 7.5 cm. The rotation period and period of work for both crops are 20 days and 10 hrs/day respectively. Calculate the right size of centrifugal pump?
3. List the common troubles in the operation of submersible pump.
4. State the principle of working of air lift pumps.
5. Why the pressure loss in an online emitter is more than in an inline emitter?
6. Write the expression which relates the length of the path in emitters to bring down the pressure in the drip system.
7. Determine the required capacity of a sprinkler system if spacing of sprinkler along the lateral is 12 m , spacing of lateral is 18m and optimum application rate is 1.25cm/hr.
8. Differentiate Semi Portable and semi permanent sprinkler system.
9. What is meant by Green House irrigation system?
10. State the purpose of the solenoid valves in micro irrigation.

PART – B (5 x 16 = 80 Marks)

11. a. i A direct driven centrifugal pump coupled to a 3-phase electric motor is installed in a deep open well. The discharge rate of the pump is 18 lps. The pump efficiency is 67%. The centre line of the pump is 60 cm vertically above the static water level and 6.2 m above the pumping water level. The suction pipe is 7.5 m long and 3 cm in diameter. A foot valve with strainer is fixed at the bottom of the suction pipe. The suction line is connected to the pump inlet by a long sweep bend of the same size as the suction pipe. The pump discharges water to the top of a pump stand of an underground pipe line water distribution system. The vertical distance between the top of the stand and the centre line of the pump is 16 m. The total length of the 7 cm diameter discharge pipeline is 24 m. The pipe fittings on the discharge sides are three long sweep bends, one gate valve and reflux valve all of them are of same size as discharge pipe. Compute Total head, Water horse power and brake horse power of the motor driving the pump. (16)

12. a. i Discuss in detail the construction , installation , operation and maintenance of submersible pump. (16)

OR

12. b.i Explain the different types of power sources and drives for a vertical turbine pump. (10)

b ii A pump lifts 94000 litres of water per hour against a head of 25 metres. Compute the water horse power. If the pump has an efficiency of 72%, what size prime mover is required to operate the pump? If a direct drive electric motor having an efficiency of 80% is used to operate the pump, compute the cost of electrical energy in a month of 30 days. The cost of electrical energy is Rs 2 per unit. (6)

(6)

13. a.i Discuss the working and advantage of a hydro cyclone filter (8)

a ii Under which site conditions are pressure compensating drippers emitters particularly suitable? What are the limitations? (6)

OR

13. b.i Plan a suitable drip irrigation system for an orchard on a nearly flat land with medium heavy soil. The dimensions of the field are 400 m x 150 m. The source of water is a tube well located at the top corner of the farm. The tree spacing is 5 m x 5m. Emitters are spaced at 1 m apart in each lateral. The monthly evaporation rate observed with a Class A Pan is 300 mm. Irrigation is to be applied daily. Determine the discharge capacity of the drip irrigation systems. (16)

14. a. i Design a sprinkler irrigation system for a square, 10 hectare field to irrigate the entire area within 10 days period. Not more than 16 hrs per day are available for moving the pipe and sprinkling. The required depth of irrigation is 5 cm and the water application rate is not to exceed 0.75 cm/hr. a 30 m deep well located in the centre of the field will provide the following discharge drawdown relationship: 12.5 lps at 15 m and 15.8lps at 20 m. Design the system for an average pressure of 3 kg/cm² at the sprinkler nozzle. The highest point in the field is 1.25 m above the well site and 1 m risers are needed for the sprinklers. Assuming a pump efficiency of 60 percent and supposing that the engine will furnish 70 percent of its rated output for continuous operation, determine the rated output for a water cooled internal combustion engine. (16)

OR

14. b. i Discuss in detail the components and the types of the sprinkler system. (10)
b ii Sketch and explain the moisture distribution pattern for a rotating head sprinkler under favorable conditions of pressure and wind. (6)

15. a.i Explain the components of a greenhouse irrigation system and how it is different from other irrigation methods (16)

OR

15. b.i Write notes on surge and cablegation (8)
b.ii Write note on-gate valve and solenoid valve (8)