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B.E / B.Tech. (Full Time) DEGREE END SEMESTER EXAMINATIONS NOV/DEC - 2012

AGRICULTURAL AND IRRIGATION ENGINEERING BRANCH

SEVENTH SEMESTER

AI 9405 – IRRIGATION EQUIPMENT AND DESIGN
(REGULATION - 2008)

Time: 3 hours **Marks: 100**

Part – A **10 x 2 = 20**

1. Answer ALL questions
2. Allowed to use tables and nomograph

1. State the principle in which jet pump works.
2. Differentiate between single and multiple stage pumps.
3. Write the functioning of diffuser when used in centrifugal pump.
4. What is net positive suction head and how it is computed?
5. Calculate the operating pressure in a long path source emitter, if the discharge is 15 lps and k is 0.63.
6. Draw the different types of layout of laterals in drip system.
7. Define uniformity coefficient in sprinkler irrigation system.
8. Write the effect of droplet size in sprinkler system?
9. What is surge and how it affects the Micro irrigation system?
10. List the types of Solenoid Valves.

Part - B **5 x 16 = 80**

11. (i) Explain the working of Butterfly and non return valves with diagram. (8)
(ii) Explain the design procedure involved in greenhouse irrigation system with a neat sketch. (8)

12.(a) (i) A centrifugal pump impeller, having outlet diameter 0.35 m is running at 960 rpm. The velocity of flow (assumed constant throughout the system) is equal to 2.4 m/s. The vane angle at outlet is 28°. The static suction lift is 4.03 m. The energy losses in suction pipe, impeller and volute casing are 0.88 m, 0.70 m and 1.26 m of water respectively. Determine the readings of vacuum or pressure gauges placed at: (a) inlet to the pump, (b) impeller outlet, (c) pump outlet or delivery flange, 0.24 m above the centreline of the pump. (10)
(ii) Write the different types of medium head indigenous water lifts and explain any one. (6)

(OR)

12(b) (i) Drive an equation to estimate the work done by reciprocating pump per second considering the effect of acceleration and friction in suction and delivery pipes using indicator diagram. (10)
(ii) Explain the fact behind the Negative slip in reciprocating pump. (6)

13(a) (i) Explain the working principle of jet pump with a neat sketch. (10)
(ii) Explain the different pump troubles and their remedies in deep well pumps. (6)

(OR)

13(b) (i) Explain the working of vertical turbine pump and propeller pumps. (10)
(ii) Draw the neat sketch of multistage submersible pump and explain its working principle (6)

14(a) (i) List the filtration systems used in Drip irrigation system and explain the working of disc filters. (8)
(ii) What are the step by step procedures required in punching the laterals and fixing drippers. (4)
(iii) How is design emission coefficient of a drip irrigation system determined? (4)

(OR)

14(b) Design a suitable drip irrigation system for an orchard on 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 form. The tree spacing is 5 m x 4m. Emitters are spread 1 m apart in each lateral. The monthly evaporation rate observed with a Class A pan is 240 mm. Irrigation is to be applied daily. Take, application efficiency as 90%, canopy coefficient as 0.75 and crop coefficient as 0.65. Assume necessary data if needed. (16)

15(a) (i) If 100 sample cans are uniformly spaced in the area covered by four sprinklers and the average depth of water caught in a given time is 1.25 cm with the average variation from the mean 0.2 cm, what is the uniformity coefficient? Assuming that the infiltration rate did not exceed and the water did not penetrate below the root zone, what is the application efficiency? (8)
(ii) Explain the centre pivot system in sprinkler irrigation with suitable figure (4)
(iii) Write the factors to be considered while designing the sprinkler irrigation system (4)

(OR)

15(b) A farmer has a land holding of 12 ha of size 200 m x 60 m. He wants to design a sprinkler irrigation system to irrigate the entire area in 5 days period. The time for moving the pipe and irrigation should not exceed 17 hrs/day. 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 18.5 lps at 25 m. The required depth of irrigation is 6 cm and the water application rate is not to exceed 0.80 cm/hr. The system is to be designed for an average pressure of 2.8 kg/cm^2 at the sprinkler nozzle. The highest point in the field is 1.30 m above the well site and 1.1 m risers are needed for the sprinklers. Assume pump efficiency as 60% and motor efficiency as 70 %. (16)
