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**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY SCHOOL OF SPATIAL PLANNING**

**UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN WATER RESOURCE AND ENVIRONMENTAL MANAGEMENT**

**SEMESTER 2016/2017 ACADEMIC YEAR**

**CENTRE: MAIN CAMPUS**

**COURSE CODE: PWE 3422**

**COURSE TITLE: IRRIGATION AND DRAINAGE**

**EXAM VENUE: STREAM: SPATIAL PLANNING**

**DATE: EXAM SESSION:**

**TIME: 2 HOURS**

**Instructions:**

1. **Answer question 1 ( compulsory ) and ANY other 2 questions.**
2. **Candidates are advised not to write on the question paper.**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

**QUESTION ONE [20 marks]**

1. Describe five benefits and five ill effects of irrigation.

**[5 marks]**

1. Discuss sources of irrigation water.

**[5 marks]**

1. Describe six functions of irrigation water.

**[6 marks]**

1. Describe the following classification of irrigation water based on:
2. Total concentration of soluble salts and
3. Sodium concentration.

**[8 marks]**

1. The Concentrations of Na, Ca and Mg in a water sample are 44, 4 and 5.7 milli-equivalent per litre respectively. The electrical conductivity is 260 micro mhos per cm at 250C.
2. Suggest the classification of water and
3. What problems might arise in using this water on fine textured soils
4. What remedies do you suggest to overcome this trouble?

**[6 marks]**

**QUESTION TWO [20 marks]**

1. With the help of a sketch describe furrow method of irrigation.

**[5 marks]**

1. State six advantages of furrow irrigation.

**[3 marks]**

1. Furrows, 100 m long and 1 m apart, having longitudinal slope of 0.3 per cent are initially irrigated by a non-erosive stream for 80 minutes. The stream size is then reduced to 40 per cent and continued for another 35 minutes. Determine the average depth of irrigation.

**[4 marks]**

1. Describe border strip method of irrigation.

**[5 marks]**

1. Find the time required to cover an area of 0.2 hectares when a tube well discharging at the rate of 0.06 cumecs for irrigating some crops. Average depth of flow is expected to be 15 cm. average infiltration rate for the soil may be taken as 10 cm/hour.

**[3 marks]**

**Question Three [20 marks]**

1. With the aid of a sketch describe the arrangement for drip irrigation system and outline the role of each component.

**[6 marks]**

1. Describe the factors affecting duty a how can duty be improved.

**[8 marks]**

1. A water course commands an irrigated an irrigated area of 600 hectares. The intensity of irrigation of rice in this area is 60 per cent. The transplantation of rice crop takes 12 days, and total depth of water required by the crop is 50 cm on the field during the transplantation period. During the transplantation period, the useful rain falling on the field is 10 m. find the duty of irrigation water for the crop on the field during transplantation, at the head of the field and also at the head of the distributary, assuming losses of water to be 20 per cent in the water course. Also, calculate the discharge required in the water course.

**6 marks]**

**QUESTION FOUR [20 marks]**

1. What is evapotranspiration and how is it determined?

**[6 marks]**

1. The following data pertains to the healthy growth of a crop.

* Field capacity of soil = 30 per cent
* Permanent wilting percentage = 11 per cent
* Density of soil = 1300 kg/m3
* Effective depth of root zone = 700 mm
* Daily consumptive use of water for the given crop = 12 mm

For healthy growth moisture content must not fall below 25 per cent of water holding capacity between the field capacity and the permanent wilting point. Determine the watering interval in days.

**[5 marks]**

1. Explain the following sprinkler irrigation system:
2. Portable sprinkler system,
3. Semi portable sprinkler system and
4. Permanent sprinkler system.

**[4 marks]**

1. Water is released at the rate of 7 cumecs at the head of sluice. If the duty at the field is 100 hectares/cumec and loss of water in transit is 25 per cent, find the area of land that can be irrigated.

**[5 marks]**

**QUESTION FIVE [20 marks]**

1. Discuss the implications of over-irrigating.

**[5 marks]**

1. Define the following irrigation efficiencies:
2. Water conveyance efficiency,
3. Water application efficiency and
4. Water storage efficiency.

**[3 marks]**

1. 10 cumecs of water is delivered to a 32 hectares field for 4 hours. Soil proving after the irrigation indicates that 0.3 metre of water has been stored in the root zone. Compute water application efficiency.

**[4 marks]**

1. Describe the following methods of estimating consumptive use
2. Direct Methods/Field Methods.
3. Empirical Methods.

**[8 marks]**