



MACHAKOS UNIVERSITY

University Examination 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

FOURTH YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECV 410: IRRIGATION ENGINEERING II

DATE: 1/8/2019

TIME: 8.30-10.30 AM

INSTRUCTIONS

- This paper comprises of five questions. Answer **three** questions
- Question one is **compulsory** and carry 30 marks
- Answer any other **two** questions

1. (a) Define the following terms as used in Irrigation Engineering
 - (i) Lateral lines (2 marks)
 - (ii) Hydraulic head (2 marks)
 - (iii) Application uniformity (2 marks)
 - (iv) Friction head (2 marks)
 - (v) Emitters (2 marks)
 - (b) Describe Four dominant variables influencing surface irrigation (8 marks)
 - (c) You have been consulted by a farmer in Machakos County to design a sprinkler irrigation system in his farm discuss the main information you need to carry out the design. (10 marks)
 - (d) A trial configuration of a hand- move sprinkler system has a lateral running down slope form a mainline along a constant grade of 0.005m/m. the design operating pressure of the nozzle is 310 kpa. The trial length of the lateral results in a distance of 450m between the first and the last sprinkler. Compute the maximum allowable head loss to friction as m/m. (12 marks)
2. (a) Describe three limitation of furrow irrigation system (3 marks)

- (b) An irrigation stream of 35 L/s is diverted to a check basin of size 16 m × 14 m. The water holding capacity of the soil is 16%. Average soil moisture in the crop root zone prior to applying water is 7.5%. The average depth of crop root zone is 1.6m and apparent specific gravity of root zone soil is 1.65. How long should irrigation stream take to replenish the root zone moisture to its field capacity, assuming no loss due to deep percolation? (12 marks)
3. (a) Describe four hydraulic stages in check basin irrigation system (6 marks)
- (b) Determine the required capacity of a sprinkler system to apply water at the rate of 1.8 cm/h. Two 180 metres long sprinkler lines are required. Sixteen sprinklers are spaced at 12 m intervals on each line. The spacing between the lines 19 m. (9 marks)
4. A lateral line length in a vegetable field is 60 m and the slope of the lateral line is 1%. There are 150 emitters spaced equally in the lateral line. The emitter flow is 4 L/s at an operating head of 10 m. Design the lateral line size. (15 marks)
5. (a) Give three specific points that must be observed when storing sprinkler equipment during off season (6 marks)
- (b) Determine the required capacity of a sprinkler system to apply water at the rate of 1.5 cm/h. Two 180 metres long sprinkler lines are required. Sixteen sprinklers are spaced at 12 m intervals on each line. The spacing between the lines is 18 m. (9 marks)