

2nd SEM.2006/2007

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**UNIVERSITY OF SWAZILAND
SUPPLEMENTARY EXAMINATION PAPER**

PROGRAMME: DIP AGRIC III & DIP AGRIC ED. III

COURSE CODE: LUM 303 (Old Programme)

TITLE OF PAPER: IRRIGATION

TIME ALLOWED: TWO (2) HOURS

SPECIAL MATERIAL REQUIRED: NONE

**INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO
OTHER QUESTIONS**

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GRANTED BY THE CHIEF INVIGILATOR**

SECTION I: COMPULSORY QUESTION

QUESTION 1

- (a) With the aid of clearly labelled diagram, briefly describe how a neutron scatter is used to determine volumetric moisture content of a soil. (10 marks)
- (b) A farmer collects undisturbed sample of a soil from his irrigation field with a wet weight of 300 g and its water content is 28 % on mass basis. The saturated water content of the soil is 36.1 % on mass basis. The density of the soil particles is 2.65 and the density of water is 1.0 g/cm³.
 - 1) Find the volumetric water content, total porosity, and air filled porosity of the sample at 28 % water content on mass basis. (15 marks)
 - 2) If the sample at 28 % water content on mass basis is representative of the top 45 cm of a 0.3 ha plot, how much water in mm and m³ must be drained from the top 45 cm layer to increase the air filled porosity to 25 %, and at what moisture content on mass basis would the soil be after this drainage. (15 marks)

SECTION II: ANSWER TWO QUESTIONS FROM THIS SECTION

QUESTION 2

With the aid a clearly labelled diagram, describe the basic principles of a tensiometer for scheduling irrigation. (30 marks)

QUESTION 3

Briefly but concisely, describe the meaning of the following terms in irrigation

- a) crop water use;
- b) effective rooting depth;
- c) gross irrigation;
- d) irrigation set time;
- e) irrigation period. (30 marks)

(QUESTION 4

The cumulative infiltration amounts (cm) for time intervals 1, 15, 30, 60, 150, and 200 minutes were 0.5, 3.2, 4.8, 7.2, 14.1 and 15.3 cm, respectively. Determine the parameters of Kostiakov infiltration equation for this soil and, hence, use the equation to determine the amount and rate of infiltration after 6 hours. (30 marks)