UNIVERSITY OF SWAZILAND
MAIN EXAMINATION PAPER

PROGRAMME: BSC IN LWM, AGRONOMY & HORTICULTURE 3

COURSE CODE: LUM 302 (NEW 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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QUESTION 1

a) Plant indicators may be used to tell if irrigation is due. Discuss the various indicators and explain the downside of using them to make irrigation scheduling decisions. **[15 marks]**

b) The Tables below show results obtained when a neutron probe was immersed in water for calibration, and then when field measurements were taken. Five readings were taken for the water standard, and three per depth for the field measurements. The calibration equation was determined to be $\theta_v = 0.958R/Rs - 0.012$. Assuming the effective radius for measurement is 5 cm and ignoring the top 10 cm, determine the total water content of 80 cm profile in mm.

Water standard

Counts per second (cps)
R1 : 791
R2 : 793
R3 : 790
R4 : 791
R5 : 791

Field measurements

Depth (cm)	**R1 (cps)**	**R2 (cps)**	**R3 (cps)**
15	482	486	487
25	481	492	493
35	443	456	459
45	467	465	468
55	474	470	476
65	466	476	474
75	476	473	468

[25 marks]

QUESTION 2

The irrigation objectives for a sports field are to improve the aesthetics of the field and also improve the playability of the ground. Dry surfaces will have a lousy brown colour while also having an increased bouncing effect which impacts on the playability. In agriculture, the irrigation objectives are as follows:

- Reliable and increased yields
- Quality of produce
- Continuity of supply to market
- Improved timeliness of planting
- Effective use of fertilisers
- Ease of harvesting

Elaborate on each point mentioned above, and give examples. **[30 marks]**

QUESTION 3

a) Define uniformity and discuss any four (4) factors affecting uniformity in sprinkler irrigation system. **[10 marks]**

b) The following results were obtained from a uniform test of a sprinkler irrigation system. The results below are given in mm.

80	70	68	74
78	66	68	70
52	56	54	64
74	60	56	86
80	70	64	86

i) Determine the Christiansen's coefficient of uniformity (CU), and comment on the outcome. **[10 marks]**

ii) Adequacy is the ratio of the average depth of irrigation water usefully stored in the root zone to the average depth required. Given that the irrigation requirement was 68 mm, calculate the adequacy. **[10 marks]**

QUESTION 4

Discuss the three (3) soil water equilibriums i.e. soil saturation, field capacity and permanent wilting point, mentioning how these can be determined both in the field and in the laboratory. Also discuss the assumptions associated with these levels of soil water, and when and how some of these assumptions may not apply in some cases.

[30 marks]