MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2012/2013

SECOND YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN HORTICULTURE WITH INFORMATION TECHNOLOGY (MAIN CAMPUS)

SHC 208: PLANT/CROP ECOPHYSIOLOGY

Date: 25th July, 2013 ***Time: 8.30 – 10.30 a.m.***

SHC 208: PLANT/CROP ECOPHYSIOLOGY

Instructions:

- *The paper has two sections (A & B)*
- *Attempt **ALL** questions in section A and any **three (3)** in section B*

Section A (40 marks)

Q1.

a) Distinguish between the following terms as used in plant eco-physiology:
   i. Biotic and abiotic environments of a crop plant
   ii. Direct and diffuse solar radiation
   iii. Dew point and dew. **(2 marks each)**

b) Define:
   i. Net radiation (R_n)
   ii. Water potential (ψ) **(2 marks each)**

c) Outline the components of Water potential (ψ) of a plant cell. **(3 marks)**

d) What are the effects of increasing solute concentration on the following:
   i. Solute chemical potential
   ii. Solute/osmotic potential (ψ_π)
   iii. Water potential (ψ) **(1 mark each)**

e) Are plant cells osmotic systems? Explain. **(4 marks)**

Q2.

a) What is the significance of dew to crop plants productivity? **(4 marks)**

b) Give an expression for the energy balance at the earth's surface. **(2 marks)**

c) What are the effects of declining soil moisture on the soil thermal conductivity? **(4 marks)**

Q3

a) Provide physiological explanation for the following observations:
   i) Ribulose-1,5-bisphosphate carboxylase (rubisco) is both a carboxylase and an oxygenase.
   ii) Ribulose-1,5-bisphosphate carboxylase (rubisco) and phosphoenol pyruvate (PEP) carboxylase are both present in the CO_2 fixing cells of crassulacean acid metabolism (CAM) plants yet only rubisco fixes CO_2 in them during daylight. **(2 marks each)**

b) Highlight the **three** (3) stages of photosynthetic carbon reduction (Calvin) cycle. **(6 marks)**

Section B (30 marks)

Attempt any three (3) questions from this section.

Q4.

a) Other than the stomatal opening/closing, outline any **two** (2) plant processes reliant on the "nearly constant volume" property of water. **(2 marks)**

b) Discuss the stomatal opening/closing mechanism. **(8 marks)**

Q5.

The leaves of pineapples are inclined at nearly vertical position at the top of canopy. The leaf inclination however gradually gets horizontal down the canopy towards the ground. What is the ecological significance of this leaf pattern to the crop light utilization? **(10 marks)**

Q6.

The cohesion model of sap ascent in plants identifies the driving force, the specialised pathway and the cohesion among water molecules as its main elements. Discuss the speciality of the xylem tissues and their role in water transport up plants. **(10 marks)**

Q7.

The light dependent photosynthetic steps involve **two** (2) photosystems. Trace the path of electrons originating from the split of water molecules in **non-cyclic** electron transport process. **(10 marks)**