CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

FOURTH YEAR EXAMINATION FOR THE AWARD OF
BACHELOR OF SCIENCE AND BACHELOR OF EDUCATION SCIENCE

ZOOL 412: POPULATION BIOLOGY

STREAMS: BED (SCI)   Y4S2   **TIME: 2 HOURS**

DAY/DATE: WEDNESDAY 8/04/2015   **8.30 AM – 10.30 AM**

INSTRUCTIONS:

Answer All Questions in Section A and any Two Questions in Section B.

Section A (30 marks)

1.   Explain the following terms

      (a)   Character displacement   [2 marks]
      (b)   Coexistence   [2 marks]
      (c)   Semelparity   [2 marks]

2.   Discuss briefly the contributions of the following people to the study of animal populations.

      (a)   Raymond Pearl   [3 marks]
      (b)   Adrewartha and Birch   [3 marks]

3.   (a)   Explain two factors that contributes to uniform distributions of organisms.
                                                        [2 marks]

      (b)   Explain the meaning of the terms in the following equation
             $$\frac{dp}{dt} = cp(1-p) - ep$$
                                                        [2 marks]

      (c)   Distinguish between the following terms:

             (i)   Interference and exploitative competition.   [1 mark]

| | | (ii)   Source and sink habitat | [1 mark] |

4.   (a)   Describe briefly type III predator response.   [3 marks]

       (b)   Explain how the following factors limit the population growth
               (i)   Competition   [1 mark]
               (ii)   Parasitism   [1 mark]
               (iii)   Natural disasters   [1 mark]

5.   (a)   Explain logistic model of population growth.   [2 marks]

       (b)   State two limitations of Lotka-Voterra predation model.   [1 mark]

       (c)   A moth population was observed to grow exponentially from 5000 to 6000
               individuals per year. From a starting population of 5000, predict the population
               after 3 years assuming no change in the rate of growth.   [3 marks]

Section B (40 marks)

6.   (a)   Discuss the adaptations of K-selected species   [10 marks]

       (b)   Describe the various survivorship curves.   [10 marks]

7.   (a)   Describe Gause's experiments.   [8 marks]

       (b)   Discuss in detail the meaning of terms, significance and limitations associated
               with the following equations

$$\frac{dN}{dt} = r_1 N_1 \left(\frac{k_1 - N_1 - \alpha_{12} N_2}{k_1} \right)$$
$$\frac{dN}{dt} = r_2 N_2 \left(\frac{k_2 - N_2 - \alpha_{21} N_1}{k_2} \right)$$ [12 marks]

8.   (a)   Discuss behavioral adaptations of organisms against predation. [10 marks]

       (b)   Describe symbiotic relationships found in organisms.   [10 marks]