



THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

A. M. E. C. E. A

MAIN EXAMINATION

JANUARY – APRIL 2015 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF NATURAL SCIENCES (BIOLOGY)

REGULAR PROGRAMME

BIO 407: BIOLOGICAL MODELING

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Date: April 2015	Duration: 2 Hours
Instructions: Answer Question ONE and any other TWO Questions.	

- Q1. a) Define:
- i) Stochastic process
 - ii) Transition probability
 - iii) Steady estate
 - iv) Random number
- (4 marks)**
- b) List the three features of survival Data.
- (3 marks)**
- c) i) Define what a markov model is and state the two markov processes.
- (3 marks)**
- ii) List FIVE ways of classifying states in a markov chain.
- (5 marks)**
- d) State the Baye's rule.
- (3 marks)**
- e) Explain what is a random variable.
- (2 marks)**
- f) List four types of distributions that are used to generate a continuous Random variable.
- (4 marks)**
- g) In a graphical model representation status two major elements used to represent date.
- (2 marks)**
- h) In survival time models the survival date is described using?
- (4 marks)**
- Q2. Explain the several ways one can classify computer simulation models.
- (20 marks)**

Q3. During the construction of a Markov chain in a stochastic model, the markov processes frequently balance these two demands nicely.

Let X_1, X_3, X_k and X_r be four events in the system.

- a) Show the equation for 2 events **(4 marks)**
- b) Show the equation for 3 events **(3 marks)**
- c) Show the equation for 4 events **(5 marks)**
- d) Using the markov property, the present depends on the immediate past and not the remote. Thus **(10 marks)**

- Q4. a) Show a graphical representation showing how a certain DNA mutation, Blood pressure and Heart disease are related. **(10 marks)**
- b) Show a graphical representation of how genes A, B and C regulate each other's expression levels (MRNA Levels)? Explain the most likely model. **(10 marks)**

Q5. Explain parameterization in Bayesian Networks in context us joint probability distribution? **(5 marks)**

Explain the Naïve Bayes model using the diabetes example. **(5 marks)**

Explain the central dogma in detail mentioning the main two processes of Transcription and translation. **(8 marks)**

Explain briefly the transcription errors and what reading frames are? **(2 marks)**

END