



# THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

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**MAIN EXAMINATION**

**JANUARY – APRIL 2019 TRIMESTER**

**FACULTY OF SCIENCE**

**DEPARTMENT OF COMPUTER AND LIBRARY SCIENCE**

**REGULAR PROGRAMME**

**DIT 012: QUANTITATIVE TECHNIQUES**

**Date: APRIL 2019**

**Duration: 2 Hours**

**INSTRUCTIONS: Answer Question ONE and any other TWO Questions**

- Q1. a) Explain the following models. **(12 marks)**
- i) iconic
  - ii) analogue
  - iii) simulation
  - iv) heuristic
- b) What is the probability of throwing a total of 10 with 2 dice? **(4 marks)**
- c) A company has four training officers and it is required to assign one to each of two training sections. In how many different ways may the four officers be assigned to the two sections? **(4 marks)**
- d) State any five typical application areas of simulation and modeling. **(5marks)**
- e) 6 apprentices have to be paired into two's for an exercise. In how many ways may this be done? **(2marks)**
- f) Assume that total overheads comprise fixed overheads and variable overheads which are directly related to the units produced. Formulate a mathematical model of the relationship of total overheads to the number of units produced. **(3 marks)**

- Q2. a) Describe the four essential features of the OR approach. **(16 marks)**
- b) How does OR assist management in decision making **(1 marks)**
- c) State three reasons why the results of an OR study may not be implemented **(3 marks)**

- Q3. a) A distributor buys perishable articles for £2 per item and sells them at £5. Demand per day is uncertain and items unsold at the end of the day represent a write off because of perishability. If he understocks he loses profit he could have made. A 300-day record of past activity is as follows:

Daily demand (units)	number of days	probability
10	30	0.1
11	60	0.2
12	120	0.4
<b>13</b>	<b>90</b>	0.3

- b) What level of stock should be held from day to day to maximize profit? **(14 marks)**
- c) State the three classes of simulation tools, giving examples of each category. **(6 marks)**
- Q4. a) State any five reasons why modeling and simulation is preferred to direct experimentation **(5 marks)**
- b) A company is considering whether to launch a new product. The success of the idea depends on the ability of a competitor to bring out a competing product (estimated at 60%) and the relationship of the competitor's price to the firm's price. The table below shows the profits for each price range that could be set by the company related to possible competing prices. Profits in Ksh "000"

If company's price is	If competitor price is			Profit if no competitor
	low	medium	high	
Low	30	42	45	50
Medium	34	45	49	70
high	10	30	53	90

The company must set its price first because its product will be on the market earlier so that the competitor will be able to react to the price. Estimates of the probability of a competitor's price are shown in the table below

If company's price is	Competitor's price expected to be		
	low	medium	high
Low	0.8	0.15	0.05
Medium	0.20	0.70	0.10
high	0.05	0.35	0.60

Draw a decision tree and analyze the problem also recommend what the company should do. **(15 marks)**

- Q5. a) Analysis of questionnaire completed by holiday makers showed that 0.75 classified their holiday as good at Costa Lotta. The probability of hot weather in the resort is 0.6. If the probability of regarding the holiday as good given hot weather is 0.9, what is the probability that there was hot weather if a holiday maker considers his holiday good? **(6 marks)**
- b) Records show that 60% of students pass their examinations at the first attempt. Using the normal approximation to the binomial, calculate the probability that at least 65% of a group of 200 students will pass at their first attempt. **(8 marks)**
- c) Outline the basic rules for drawing networks. **(4 marks)**
- d) What is critical path of a network? **(2 marks)**

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