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MAIN EXAMINATION

AUGUST - DECEMBER 2016 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

REGULAR PROGRAMME

DIT 012: QUANTITATIVE TECHNIQUES

Date: DECEMBER 2016	**Duration: 2 Hours**
INSTRUCTIONS: Answer Question ONE and ANY other TWO Questions	

Q1. a) Define the following terms
- i) Operation research
- ii) Simulation
- iii) Modeling
- iv) Sub-optimization **(4 marks)**

b) Records of service requests at a garage and their probabilities are as follows:

Daily demand	Probability
5	0.3
6	0.7

Daily demand is independent. What is the probability that over a two day period the number of requests will be:
- i) 10 requests **(2 marks)**
- ii) 11 requests **(3 marks)**
- iii) 12 requests **(2 marks)**

c) Describe the following types of models
- i) Mathematical **(2 marks)**
- ii) Iconic **(2 marks)**
- iii) Analogue **(2 marks)**
- iv) Heuristic **(2 marks)**

d) State three methods of data collection **(3 marks)**

e) Define the following terms
   i) Sampling **(1 mark)**
   ii) Forecasting **(1 mark)**
   iii) Dispersion **(1 mark)**

f) For the sample data below:
   5,8,15,29,47,47,64,71,74
   Calculate:
   i) The mean **(2 marks)**
   ii) The standard deviation **(3 marks)**

Q2. a) Describe the stages in an OR study **(14 marks)**

b) How does OR assist management in decision making **(3 marks)**

c) State three reasons why the results of an OR study may not be implemented **(3 marks)**

Q3. a) The number of cars that enter the parking follows a Poisson distribution with a mean rate of 20 cars per hour.

Determine:
   i) The probability of having exactly 15 cars entering the parking in one hour **(4 marks)**

   ii) The probability of having more than 3 cars entering the parking in one hour **(4 marks)**

b) State any three typical examples which maybe characterized by a Poisson process **(6 marks)**

c) State the three classes of simulation tools, giving examples of each category. **(6 marks)**

Q4. 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 3000-day record of past activity is as follows:

Daily demand(units)	No. of days	P
10	30	0.1
11	60	0.2
12	120	0.4
13	90	0.3
	300	1.0

What level of stock should be held from day to day to maximize profit?
(10arks)

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 competitor price is			
If company's price is	low	medium	high	Profit if no competitor
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

	Competitor's price expected to be		
If company's price is	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. **(10 marks)**

Q5. a) State any five reasons for holding stocks. **(5 marks)**

b) State four characteristics of a problem that can be solved using linear programming technique. **(4marks)**

c) What similarities to the simplex method has the usual transportation solution technique? **(4 marks)**

d) Outline the basic rules for drawing networks. **(4 marks)**

e) What is critical path of a network? **(1 mark)**

END