KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

2008/2009 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF SCIENCE IN ECONOMICS AND MATHEMATICS

COURSE CODE: **ECON 415**

COURSE TITLE: **OPERATION RESEARCH II**

STREAM: **Y4S1**

DAY: **TUESDAY**

TIME: **8.30 – 10.30 A.M.**

DATE: **12/8/2008**

INSTRUCTIONS:

1.   Answer **QUESTION ONE** and any other **TWO** questions.

2.   All questions carry equal marks

3.   Use of relevant examples or illustration is encouraged

PLEASE TURN OVER

QUESTION 1

(a)   Outline and explain the difference between Network Analysis and Gantt charts

(6mks)

(b)   Omega housing company has been contracted to build police posts to be used in enhancing security for IDP's when settled. The company estimates that for each police post several activities must be carried out. The times required in days for each activity is shown below with associated costs

Activity	A	B	C	D	E	F	G
Preceding activities	-	A	A	A,C	B,C	E,D	E,F
Time in days	5	4	6	7	8	6	5
Normal Cost (Ksh 100)	25	16	36	49	64	39	23
Crash time	4	4	4	5	6	5	4
Crash cost (Ksh 100)	30	16	42	55	72	45	28

Required
   (i)   Determine the total project projection   **(3mks)**

   (ii)   Identify the critical activities and the critical path(s).   **(3mks)**

Due to onset of longrains in the region the projects have to be hastened and finished as quickly as possible.

   (iii) What would be the shortest possible duration?   **(4mks)**

   (iv)   What would the total project cost for the shortest duration? **(3mks)**

QUESTION 2

(a)   In a study that was conducted by coca-cola Africa on the major competing brands i.e. coke, fanta and sprite it was discovered that out of those who bought coke on their last purchase 10% switched to fanta and 5% to sprite. Out of those who bought fanta on their last purchase 20% switched to coke and 10% to sprite. Out of those who bought sprite at last purchase 15% switched to coke 20% to fanta.

Required
   (i)   Use the above information to formulate a transition matrix.

(2mks)

   (ii)   Predict the number of consumers for each brand in two months

(5mks)

   (iii) Predict the number of consumers for each brand at steady state

(8mks)

(b)   Using relevant examples explain the condition under which Markovian process is applicable in business analysis and forecasting.

(5mks)

QUESTION 3

(a)   Photocopying is done in batches. On average, six employees per hour need to use the facility and their time is valued at £3.00per hour. A decision needs to be made on whether to rent a type A or type B photocopying machines. The type A machine can complete an average job in five minutes and has a rental charge of £16 per hour, whereas the type B machine will take eight minutes but has a rental change of £12 per hour. Which machine is most effective?

(8mks)

(b)   In a petrol station with a single pump, customers arrive in a process with an average time of 10 minutes between arrivals. The time intervals between service at the station follow an exponential distribution and as such the mean time it takes to service a unit is 6 minutes. On the basis of this information you are required to answer the following questions.

    (i)   What would be the average number of customers in the system?

    (ii)   How much time on average does a customer spend in the system?

    (iii)   What would be the expected average queue length?

    (iv)   How long on average does a customer wait in the queue before being served?

    (v)   What is the probability of a customer being in the system (waiting and being served) longer than 10 minutes?

(12mks)

QUESTION 4

(a)   Discuss the relevance of operation Research models in business management today.   **(10mks)**

(b)   Demand for a product used by a company tends to be constant at an annual rate of 5000 units. The cost per unit for this product is Sh 50 and cost of placing an order is Sh 80. The company estimates that the annual inventory carrying cost of product is about 20% of cost per year. The company worked for 320 days in a year, while lead time for the item is 25 days.

Required
    (i)   Determine the best inventory policy

(ii)   Suppose demand for the item increases by 50% yet the firm continues with the policy determined in part (b i), calculate the cost savings the firm will be foregoing annually.   **(10mks)**

QUESTION 5

(a)   A trader in a town has studied his varying monthly sales and monthly expenses (including the value of goods) and has arrived at the following empirical distributions.

Monthly sales **(in thousands Ksh)**	**Rubabilities**	**Monthly expenses** **(in thousand Ksh)**	**Probabilities**
150	0.30	120	0.15
160	0.25	130	0.20
170	0.15	140	0.25
180	0.15	150	0.20
190	0.10	160	0.15
200	0.05	180	0.05

(i)   The trade at the beginning of the year has Ksh 20,000 in the bank. Simulate his sales and expenses over a year. Assume that the trader can avail temporary overdraft facilities to cover any negative balances. (Use random numbers below).

(ii)   How much money does the trader have at the end of the year?
                                                                                          (20mks)

NB: Random number table.

52	37	06	50	82	69	98	30
96	33	74	60	88	90	49	27