KABARAK   **UNIVERSITY**

EXAMINATIONS

2008/2009 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF SCIENCE, ECONOMICS AND MATHEMATICS

COURSE CODE: **ECON 415**

COURSE TITLE: **OPERATION RESEARCH II**

STREAM: **Y4S1**

DAY: **TUESDAY**

TIME: **11.00-1.00 P.M.**

DATE: **16/12/2008**

INSTRUCTIONS:

1. **Answer question ONE and any other TWO questions**
2. **Question ONE carries 30 marks and the rest 20 marks each**
3. **Show your workings clearly**

PLEASE TURN OVER

1. a) Briefly explain the advantages and disadvantages of simulation.   **(9 marks)**

   b) Avico Enterprises manufacturers 30 items per day. The sales of these items depend upon demand which has the following distribution.

Sales (Units	Probability
27	0.10
28	0.15
29	0.20
30	0.35
31	0.15
32	0.05

The production cost and selling price of each unit are Kshs.40 and Kshs.50 respectively. Any unsold product is to be disposed off at a loss of Kshs.15 per unit. There is a penalty of Kshs.5 per unit if the demand is not met.

Required.

   (i)   Using the following random numbers estimate total profit/loss for the company for the next 10 days (Random numbers: 03 99 38 17 32 69 57 24 61 30 48 80 33 78 55).
   (ii)   If the company decides to produce 29 items per day, what is the advantage or disadvantage to the company?   **(10 marks)**

(c) Telephone industry has been facing intense competition with customers switching between the 3 competitors i.e Safaricom, Zain and Telkom. Analysis of the subscribers movement for the previous months shows that out of the Safaricom subscribers 20% switched to Zain, 10% to Telkom. Out of the Zain subscribers 15% switched to Safaricom and 5% to Telkom. Out of the Telkom subscribers 5% switched to Safaricom and 10% to Zain. The research also showed that Safaricom controls 50% the market share, Zain control 35% and Telkom controls 15%.

Required

   (i)   Calculate the market share for the companies in a month time after the evaluation.
   (ii)   Calculate the market share at steady state
   (iii) Prove that at steady state customers are still switching.   **(11 marks)**

2. (a) Briefly but clearly explain the fundamental elements of queuing process
                                                                        (9 marks)
   (b) Students arrival at a university cafeteria is at an average rate of 7 students per minute, which is slower than attendant service rate which is 6 students per minute. The manager

of the cafeteria wishes to calculate the average number of students in the cafeteria, the average time each student spends in the queue and the average time each student spends the system. Assume that students arrive randomly at each time at the rate of 5 per minute. Calculate the operating statistics for this cafeteria.

(11 marks)

3. (a) Explain the following concepts as applied in inventory control.

        (i)   Re-order level
        (ii)   Carrying Costs
        (iii)   Holding Costs
        (iv)   Stock out Costs   **(6 marks)**

(b) Kabarak University Printing Press (KUPP) uses 20,000 packets of paper each year. The ordering cost is Kshs.2,000 per order. Storage and usage costs have been estimated at Kshs.75 per packet per annum based on average annual stock. The price per packet is Kshs.1,200. The usual supplier has offered a 2% quantity discount if the KUPP purchases 450 or more packets at any one time.

Required

        (i)   Compute EOQ.
        (ii)   Compute the total costs with EOQ situation.
        (iii)   Compute the total costs when quantity discount is offered.
        (iv)   Compare the two costs and advice KUPP on the best decision. **(14 marks)**

4.   A building construction company had project which was divided into several activities. The estimate made of the time and cost of each activity under normal conditions and crash conditions were as follows:-

Activity	Duration (Weeks)		Cost in £	
	Normal	**Crash**	**Normal**	**Crash**
0-1	2	2	1,500	1,500
0-2	3	2	3,000	6,000
1-3	7	4	4,000	10,000
2-3	8	3	5,000	9,000
2-4	6	4	8,500	12,500
3-4	4	2	6,000	12,000
3-5	8	6	10,000	15,000
4-5	5	3	2,000	7,000
5-6	1	1	5,000	5,000

Required

(i)   Draw the network and determine the project duration   **(7 marks)**

(ii)   Identify the critical path and critical activities   **(3 marks)**

Due to the owner's business schedule he wanted the construction company to reduce the project duration to 15 weeks.

(iii)   What would the project cost be for crashing the project to 15 weeks?

(6 marks)

(iv)   As an expert in network analysis, briefly explain to the owner, factors to be considered when crashing a project and whether you would advice the owner to crash the project or not.

(4 marks)

5.   Discuss the relevance of operation research models in business management and economics.   **(20 marks)**