



**KABARAK**

**UNIVERSITY**

**UNIVERSITY EXAMINATIONS**

**2008/2009 ACADEMIC YEAR**

**FOR THE DEGREE OF BACHELOR OF COMMERCE**

**COURSE CODE:** BMGT 410

**COURSE TITLE:** OPERATIONS RESEARCH

**STREAM:** Y4S1

**DAY:** MONDAY

**TIME:** 8.30 – 10.30 A.M.

**DATE:** 11/8/2008

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**INSTRUCTIONS:**

The paper contains four questions

1. Attempt questions **ONE** and any other **TWO** questions.
2. **DO NOT** write anything on the question paper
3. Read Instructions on the answer booklet carefully.

**PLEASE TURN OVER**

**QUESTION ONE (30 MARKS)**

(a) Any problem that requires positive decision to be made can be classified as an operations research (OR) type problem. However the approach used in decision making has changed considerably over the years.

(i) Discuss the characteristics of an OR project **(7mks)**

(ii) Explain the various milestones in the development of OR in the world in general and particularly in Kenya **(6mks)**

(b) A firm manufactures 3 products A, B and C. The profits are Ksh 3, Ksh 2 and Ksh 4 respectively. The firm has two machines and given below is the required processing time in minutes for each machine on each product.

	<b>Machine A</b>	<b>Machine B</b>	<b>Machine C</b>
<b>X</b>	4	3	5
<b>Y</b>	3	2	4

Machine X and Y have 2000 and 2500 minutes respectively. The firm must manufacture 100 A's, 200 B's and 50 C's but no more than 150 A's. Formulate this as an LP problem. **(7mks)**

(c) A publisher has just signed a contract for the publication of a book. The tasks are given in the table below along with their time estimate given in weeks.

<b>Task</b>	<b>Precedence</b>	<b>Most likely time</b>	<b>Optimistic time</b>	<b>Pessimistic time</b>
A. Appraisal of book by reviewers	-	8	4	10
B. Initial pricing of book	-	2	2	2
C. Assessment of marketability	A,B	2	1	3
D. Revisions by author	A	6	4	12
E. Editing of final draft	C,D	4	3	5
F. Typesetting of text	E	3	3	3
G. Plates for artwork	E	4	3	5
H. Designing and printing of jacket	C,D	6	4	9
I. Printing and binding of book	F,G	8	6	16
J. Inspection and final assembly	I,H	1	1	1

Required:

- (i) Draw a network diagram for the above tasks (4mks)
- (ii) Determine the critical path and expected time of the above project (6mks)

### **QUESTION TWO**

- (a) Define the following terms as used in inventory management
  - (i) Lead time (2mks)
  - (ii) Re order level (2mks)
  - (iii) Shortage cost (2mks)
  - (iv) Periodic review system (2mks)
- (b) A company has to supply 1000 times per month at uniform rate and each time a production run is started it costs Ksh 200 cost of storing is Ksh 20 per item per month. The number of items to be produced per run has to be ascertained. Determine the total set-up cost and average inventory cost if the run size 500, 600,700, 800. Find the optimal production run size using EOQ formula (12mks)

### **QUESTION THREE**

- (a) Explain the characteristics of a queuing system.
- (b) Customers arrive at a one window drive in bank according to Poisson distribution with mean 10 per hour. Service time per customer is exponential with mean 5 minutes. The space in front of the window including that for the serviced car can accommodate a maximum of three cars. Others can wait outside this space.
  - (i) What is the probability that an arriving customer can drive directly to the space in front of the window? (4mks)
  - (ii) What is the probability that an arriving customer will have to wait outside the indicated space? (4mks)
  - (iii) How long is an arriving customer expected to wait before starting service? (4mks)

**QUESTION FOUR**

- (a) Explain the procedure of solving a replacement problem when the time value of money is considered **(5mks)**
- (b) What is the optimal replacement policy for items that deteriorate suddenly **(5mks)**
- (c) A truck owner finds from his past records that the maintenance costs per year of a truck whose purchase price is Ksh 8,000 are given below

Year	1	2	3	4	5	6	7	8
Maintenance cost	1000	1300	1700	2200	2900	3800	4800	6000
Resale price	4000	2000	1200	600	500	400	400	400

Determine the time at which it is profitable to replace the truck **(10mks)**