KABARAK   UNIVERSITY

UNIVERSITY EXAMINATIONS

2009/2010 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF SCIENCE

ECONOMICS AND MATHEMATICS

COURSE CODE: ECON 415

COURSE TITLE: OPERATIONS RESEARCH II

STREAM: Y4S1

DAY: FRIDAY

TIME: 3.00 -5.00 P.M.

DATE: 13/08/2010

INSTRUCTIONS

1. Answer question ONE and any other TWO questions
2. Begin each question on a separate page
3. Show your workings clearly and neatly.

PLEASE TURNOVER

QUESTION ONE (30 MARKS)

a) Differentiate between group replacement and individual replacement **(6 marks)**

b) What are the basic characteristics of a queuing system **(3 marks)**

c) What are limitations of simulation **(4 marks)**

d) In a public telephone booth calls arrive at an average of 15 per hour.A call on average takes 3 minutes. If there is just one phone, find
   - i) The expected number of callers in the booth at any time **(3 marks)**
   - ii) The proportion of the time the booth is expected to be idle **(3 marks)**

e) The probability transition matrix of the switching probabilities, consider that two brands G and X share the market in the ratio of 60% to 40% respectively of customers. If in every week 70% of G's customers retain the brand but 30% switch to product x where as 80% of X's customers retain brand but 20% percent switch to brand G. Analyse the exchange in share market per week **(6marks)**

f) State the assumptions of basic EOQ model **(5marks)**

QUESTION TWO (20 MARKS)

An automobile production line turns out about 100 cars a day but deviations occur owing to many causes. The production is more accurately described by a probability distribution given below

Production/day	probability	Production/day	probability
95	0.03	102	0.10
96	0.05	103	0.07
97	0.07	104	0.05
98	0.10	105	0.03
99	0.15		
100	0.20		
101	0.15		

Finished cars are transported across the bay at the end of each day by ferry. If the ferry has space for only 101 cars, what will be the average number of cars waiting to be shipped and what will be the average number of empty spaces on the ship

QUESTION THREE (20 MARKS)

a) Given the cost of the equipment C = Ksh. 10000. Its operation cost and resale values are given below;

Year	1	2	3	4	5	6	7	8
Operating cost	1000	1200	1400	1700	2000	2500	3000	3500
Resale	6000	4000	3200	2600	2500	2400	2000	1600

Determine at what time it could be replaced **(7marks)**

b) In a supermarket, the average arrival rate of customer is 10 every 30 minutes following poisson process. The average time taken by a cashier to list and calculate the customers purchase is 2.5 minutes following exponential distribution.
   i)   What is the probability that the queue exceeds 6 **(3marks)**
   ii) What is expected time spent by a customer in the system **(3marks)**

c) The state-transition matrix for retentions, gains and losses of firms A , B and C are given below. Using matrix, determine the steady state equilibrium conditions:

TO

From	A	B	C
A	0.7	0.1	0.2
B	0.1	0.8	0.10
C	0.2	0.1	0.7

(7marks)

QUESTION FOUR (20 MARKS)

WIPA Corporation is both a producer and a user of brass couplings. The firm operates 220 days a year and uses the couplings at a steady rateof 50 per day. Couplings can be produced at a rate of 200 per day. Annual storage cost is $1 per coupling and machine setup cost is $35 per run;

i)   Determine the economic run size   **(5marks)**
ii)   Approximate how many runs per year will there be   **(4marks)**
iii)   Compute the maximum inventory level   **(5marks)**
iv)   Determine the length of the pure consumption portion of the cycle   **(6marks)**

QUESTION FIVE (20 MARKS)

A small project consisting of eight activities has the following characteristics

Activity	preceding activity	Time estimates in weeks		
		Most optimist	Most likely	Most pessimistic
A	None	2	4	12
B	None	10	12	26
C	A	8	9	10
D	A	10	15	20
E	A	7	7.5	11
F	B,C	9	9	9
G	D	3	3.5	7
H	E,F,G	5	5	5

i.   Draw the PERT network for the project   **(3marks)**
ii. Determine the critical path   **(4marks)**
iii. Prepare the activity schedule for the project   **(10marks)**
iv. If a 30 days deadline is imposed, what is the probability that the project will be
     finished within the time limit   **(3marks)**