UNIVERSITY OF SWAZILAND

DEPARTMENT OF STATISTICS AND DEMOGRAPHY

FINAL EXAMINATION, 2006

COURSE TITLE: OPERATIONS RESEARCH II

COURSE CODE: ST 408

TIME ALLOWED: TWO (2) HOURS

INSTRUCTION: ANSWER ANY THREE QUESTIONS

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THE INVIGILATOR

Question 1

A large bakery buys flour in 25-pound bags. The bakery uses an average of 4,860 bags a year. Preparing an order and receiving a shipment of flour involves a cost of $10 per order. Annual carrying costs are $75 per bag.
(a) Determine the economic order quantity
(b) How many orders per year will there be?
(c) Compute the total cost of ordering and carrying flour.
(d) If ordering costs were to increase by $1 per order, how much would that affect the minimum total annual cost?

Question 2

Consider a project with eight activities (A, B, C, D, E, F) with the following precedence relations and time estimates in weeks:

Job	Precedence	Optimistic Time	Most Likely Time	Pessimistic Time
A	-	2	5	8
B	A	4	4	6
C	A	6	7	8
D	A	8	8	8
E	B,C,D	1	4	7
F	E	3	4	6

(a) Draw the network for the above project
(b) Determine the expected duration and variance for each activity
(c) Identify the critical path
(d) What is the probability of not completing the project in 145weeks?

Question 3

(a) Identify the term being described for each of the following:
- A sequence of activities in a project
- The longest time sequence of activities in a project
- Shortening an activity by allocating additional resources

(b) The project described below has just begun. It is scheduled to be completed in 11 weeks.
(i) If you were the manager of this project, would you be concerned? Explain
(ii) If there is a penalty of E5 000 for each week the project is late, what is the probability of incurring a penalty of at least E5 000?

Activity	Estimated time (weeks)	Standard deviation (weeks)
1 – 2	4	0.7
1 – 3	3	0.62
2 – 4	6	0.9
3 – 4	9	1.90

Question 4

An Airline is planning to open a satellite ticket desk in a new shopping plaza, staffed by one ticket agent. It is estimated that requests for tickets and information will average 15 per hour, and requests will have a Poisson distribution. Server time is assumed to be exponentially distributed. Previous experience with similar satellite operations suggests that mean service time should average about three minutes per request. Determine each of the following:
(a) System utilisation
(b) Percentage of time the server (agent) will be idle
(c) The expected number of customers waiting to be served
(d) The average time customers will spend in the system
(e) The probability of zero customers in the system

Question 5

A manager has complied estimated profit for various capacity alternatives but is reluctant to assign probabilities to the states of nature. The payoff table (in $ thousands) is:

Alternative	State of Nature	
	#1	#2
A	$20	$140
B	120	80
C	100	40

(a) Plot the estimated profit lines on a graph.
(b) Is there any alternative that would never be appropriate in terms of maximising expected profit? Explain on basis of the graph
(c) For what range of P(2) would alternative A be best choice if the goal is to maximise expected profit?
(d) For what range of P(1) would alternative A be the best choice if the goal is to maximise expected profit?

END OF EXAM

GOOD LUCK!!!