UNIVERSITY OF ESWATINI

MAIN EXAMINATION PAPER 2019

TITLE OF PAPER:	OPERATIONS RESEARCH 2
COURSE CODE:	STA 408
TIME ALLOCATED:	2 (TWO) HOURS
REQUIREMENTS:	CALCULATOR
INSTRUCTION:	ANSWER ANY 3 (THREE) QUESTIONS OF YOUR CHOICE. ALL QUESTIONS CARRY THE MARKS AS INDICATED WITHIN THE PARENTHESIS

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QUESTION ONE [4+8+2+2+2]

a) State the 4 steps of decision theory Approach.
b) What are the different environments in which decisions are made?

c) Dr Thomas has been thinking about starting his own independent nursing home. The problem is to decide how large the nursing home should be. The annual returns will depend on both the size of the nursing home and a number of marking factors. After a careful analysis, Dr Thomas developed the following table:

Size of the nursing home	Good Market	Fair Market	Poor Market
Small	50,000	20,000	-10,000
Medium	70,000	35,000	-25,000
Large	90,000	35,000	-45,000
Very Large	200,000	25,000	-120,000

i) what is the Maximax decision,
ii) what is the Maximin decision,
iii) What is the minimax regret criterion

QUESTION TWO [20]

A company is currently working with a process, which after paying for materials, labour, etc brings a profit of R12,000. The company has the following alternatives:

i) the Company can conduct research R1 which is expected to cost R10,000 and has 90% probability of success. If successful, the gross income will be R26,000

ii) The company can conduct research R2, expected to cost R6,000 and has a probability of 60% success. If successful, the gross income will be R24,000.

iii) The company can pay R5,000 as royalty of new process which will bring a gross income of R20,000

iv) The company may continue the current process.

Because of limited resources, only one of the two types of research can be carried out at a time. Draw the decision tree and find the optimal strategy for the company

QUESTION THREE [10+5+5]

The project schedule has the following characteristics:

Activity	Time (weeks)	Activity	Time (weeks)
1 – 2	4	5 – 6	4
1 – 3	1	5 – 7	8
2 – 4	1	6 – 8	1
3 – 4	1	7 – 8	2
3 – 5	6	8 – 10	5
4 – 9	5	9 – 10	7

a) Construct the network diagram

b) Determine the minimum time to complete the project. (by computing the E for each event)

c) Identify the critical path (By computing the L for each event)

QUESTION FOUR [3+3+3+3+4+4]

a) A self – service store employs one cashier at its counter. Nine customers arrive on an average every 5 minutes while the chaiser can serve 10 customers in 5 minutes. Assuming Possion distribution for arrival rate and exponential distribution for service time, find

i) Average number of customers in the system

ii) Average number of customers in the queue or average queue length

iii) Average time a customer spends in the system

iv) Average time a customer waits before being served

b) A person repairing radios finds that the time spent on the radio sets has exponential distribution with mean 20 minutes. If the radios are repaired in the order in which they come in and their arrival is approximately Poisson with an average rate of 15 for 8 hour day,

i) what is the repairmen's expected idle time each day?

ii) How many jobs are ahead of the average set just brought in?

QUESTION FIVE [20]

A manufacturer has entered into a contract for the supply of the following number of units of a product at the end of each month. The units manufactured during a month are available for supply at the end of the month or they may be kept in storage at a cost of R2 per unit per month. Each time the manufacture of a batch of units is undertaken; there is a set – up cost of R400. Determine the production schedule which will minimize the total cost

Month	Jan	March	August	October	November	December
Number of units	10	5	20	3	6	30

END OF EXAMINATION