UNIVERSITY OF SWAZILAND

FACULTY OF COMMERCE

DEPARMENT OF BUSINESS ADMINISTRATION

FINAL XAMINATION PAPER; FULL TIME STUDENTS

MAY 2013

TITLE OF PAPER : MANAGEMENT SCIENCE11

COURSE CODE : BA 310/BA407

TIME ALLOCATED : THREE [3] HOURS

TOTAL MARKS : 100 MARKS

INSTRUCTIONS

1. TOTAL NUMBER OF QUESTIONS IN THIS PAPER IS 4
2. THE PAPER CONSISTS OF SECTION A AND SECTION B
3. ANSWER ALL QUESTIONS IN SECTION A AND ANY TWO [2] QUESTIONS IN SECTION B.
4. THE MARKS ALLOCATED FOR A QUESTION/PART OF A QUESTION ARE INDICATED AT THE END OF EACH QUESTION/PART OF A QUESTION.
5. NOTE: MAXIMUM MARKS WILL BE AWARDED FOR QUALITY, LAYOUT, ACCURACY, AND GOOD PRESENTATION OF WORK.

THIS PAPER MUST NOT BE OPENED UNTIL PERMISSION HAS BEEN GRANTED BY THE INVIGILATOR.

SECTION A : ANSWER ALL QUESTIONS IN THIS SECTION [50 MARKS].

QUESTION 1.

a. Matsapha Manufacturing Company presently has factories in Siteki and Luyengo, and has got three warehouses at Manzini, Mbabane and Big Bend. A new factory at Hlathikulu is being proposed to increase factory capacity. Dludlu, the company's Chairman wants to know what the company's monthly shipping costs will be with the new factory located at Hlathikulu. The monthly capacities of the old and new factories, the monthly warehouse requirements, and the transportation costs per unit from each factory to each warehouse are shown below;

Monthly factory Capacity (000)		**Monthly warehouse requirements(000 tons)**	
Siteki	400	Manzini	300
Luyengo	1000	Mbabane	900
Hlathikulu	600	Big Bend	800
Total	**2000**	**Total**	**2000**

Transportation costs table

Factories	**Warehouses**		
	Manzini	Mbabane	Big Bend
Siteki	E31	E21	E42
Luyengo	E 20	E21	E 30
Hlathikulu	E 23	E 20	E15

i. Use both the Lowest Cost Cell method and the North West Corner method to determine the initial monthly transportation cost when the new factory is located at Hlathikulu. **(12 marks)**

ii. Apply the Stepping stone method to improve the transportation cost under the North West corner method and indicate how many units must be shipped from each factory to each warehouse after the new factory has been built and what the optimal the cost will be **(16 marks)**

[Total Marks 28]

b. To complete the construction of UNISWA transport workshop, the project Director has laid out the major steps and seven activities involved. The activities have been labelled A to G in the following table, which also shows their estimated completion times (in weeks) and immediate predecessors. (see table of activities below for details)

Project activities

Activity	**a**	**m**	**b**	**Immediate Predecessors**
A	1	2	3	----
B	2	3	4	----
C	4	5	6	A
D	8	9	10	B
E	2	5	8	C,D
F	4	5	6	B
G	1	2	3	E

i. Draw diagram of all the transport workshop project activities **(6 marks)**

ii. Calculate the expected time and variance for each activity **(8 marks)**

iii. Which activities fall along the critical path for the entire transport workshop project? **(6 marks)**

iv. Determine the project's expected completion time **(2 marks).**

[Total Marks 22]

SECTION B: CHOOSE TWO (2) QUESTIONS OF YOUR CHOICE FROM THIS SECTION. EACH QUESTION CARRIES 25 MARKS.

QUESTION 2.

a. UNISWA Maintenance unit employs five joiners. Each joiner has different abilities and skills and takes different amounts of time to do each job. At present there are five jobs to be allocated. The time taken for each job by each person is given below.

Time per job (hours)

	Job 1.	Job 2.	Job 3.	Job 4.	Job 5.
M1	25	16	15	14	13
M2	25	17	18	23	15
M3	30	15	20	19	14
M4	27	20	22	25	12
M5	29	19	17	32	10

The jobs have to be assigned one job to one joiner. How should this be done in order to minimize the total man time needed to finish all of the jobs? **(15 marks).**

b. Assuming UNISWA Maintenance Department can employ an additional part time joiner who can do the same jobs in times shown in the following table; how would this affect the assignment of the jobs to minimize total time? **(10 marks).**

Time per job (hours)

	Job 1.	Job 2.	Job 3.	Job 4.	Job 5.
M6	28	16	19	16	15

[Total Marks 25]

QUESTION 3.

a. Gcebile Dlamini has a car repairs workshop in Mbabane that also specialises on alarm system installations. Dlamini's mechanic Phindile Vuyo is able to install new alarm systems at an average rate of 3 per hour, or about 1 every 20 minutes. Customers needing this service arrive at the shop at an average of 2 per hour. The shop owner studied Management Science and Operations Management at UNISWA in which she learnt about the Queuing Theory. She therefore feels that all the conditions for a single channel model are satisfied in the above example. Can you now assist her to calculate the values of the operating characteristics of the Queuing model listed below?

i. Average number of customers in the system (L)

ii. The average time a customer spends in the system(W)

iii. Average number of customers in the queue(Lq)

iv. Average waiting time the customer spends waiting in the queue(Wq)

v. The probability that the service facility is being used(p)

vi. Percentage idle time (P0) **(12 marks).**

b. The owner of an old fashioned restaurant that specialised on Chinese food, Biggy Ndlovu contemplates adding traditional Swazi food which has become popular these days. The required expansion means Biggy has to rent additional space that will cost E6, 000 per month. Variable costs will be E2 per plate and traditional food would retail for E7.00 per plate.

i. How many pies must be sold in order to break even?

ii. What would the profit (loss) be if 1,000 plates of traditional food are sold in a month?

iii. How many plates of traditional food must be sold to realise a profit of E4, 000?

iv. If 2,000 plates can be sold, and a profit target is E5, 000, what price should be charged per plate? **(13 marks)**

[Total Marks 25]

QUESTION 4.

i. Mabhensane plumping and heating maintains a stock of 125 litres hot water bottles that it sells to home owners and installs for them. Owner, Harry Mkize likes the idea of having a large supply on hand to meet customer demand, but he also recognises that it is expensive to do so. He examines the water bottles sales over the past 50 weeks and notes the following;

Hot water heater sales per week	**Number of weeks this number was sold**
4	6
5	5
6	9
7	12
8	8
9	7
10	3
Total	50

a. If Mabhensane maintains a constant supply of 8 hot water bottles in any given week, how many times will he be out of stock during a 20 week simulation? Use random numbers from the seventh column of the attached table, beginning with the random digit 10 **(10 marks).**

b. What is the number of average sales per week, including stock outs over the 20 week period? **(2 marks)**

c. Using the expectation (non simulation) method what is the expected number of sales per week? How does the answer you get here compare with the answer you get in (b) above?

(6 marks)

[18 Marks]

ii. Use Vogel's Approximation Method to determine the initial transportation cost for a company that has to move stocks from supply sources 1 (120 tonnes), and supply sources 2 and 3, (80 tonnes) each. The stocks are being moved to destinations A, B, and C with restricted requirements of 150 tonnes, 70 tonnes, and 60 tonnes respectively **(7 marks)**

Transportation rates are as per the table below;

From\To	A	B	C
1	E8	E5	E6
2	15	10	12
3	3	9	10

[Total Marks 25]

END OF EXAMINATION: GOOD LUCK!!!!

TABLE 15.5

Table of Random Numbers

52	06	70	88	53	30	10	47	99	37	66	91	35	32	00	84	57	07
37	63	28	02	74	35	24	03	29	60	74	85	90	73	59	55	17	60
82	57	68	28	05	94	03	11	27	79	90	87	92	41	09	25	36	77
69	02	36	49	71	99	32	10	75	21	95	90	94	38	97	71	72	49
98	94	90	36	06	78	23	67	89	85	29	21	25	73	69	34	85	76
96	52	62	87	49	56	59	23	78	71	72	90	57	01	98	57	31	95
33	69	27	21	11	60	95	89	68	48	17	89	34	09	93	50	44	51
50	33	50	95	13	44	34	62	64	39	55	29	30	64	49	44	30	16
88	32	18	50	62	57	34	56	62	31	15	40	90	34	51	95	26	14
90	30	36	24	69	82	51	74	30	35	36	85	01	55	92	64	09	85
50	48	61	18	85	23	08	54	17	12	80	69	24	84	92	16	49	59
27	88	21	62	69	64	48	31	12	73	02	68	00	16	16	46	13	85
45	14	46	32	13	49	66	62	74	41	86	98	92	98	84	54	33	40
81	02	01	78	82	74	97	37	45	31	94	99	42	49	27	64	89	42
66	83	14	74	27	76	03	33	11	97	59	81	72	00	64	61	13	52
74	05	81	82	93	09	96	33	52	78	13	06	28	30	94	23	37	39
30	34	87	01	74	11	46	82	59	94	25	34	32	23	17	01	58	73
59	55	72	33	62	13	74	68	22	44	42	09	32	46	71	79	45	89
67	09	80	98	99	25	77	50	03	32	36	63	65	75	94	19	95	88
60	77	46	63	71	69	44	22	03	85	14	48	69	13	30	50	33	24
60	08	19	29	36	72	30	27	50	64	85	72	75	29	87	05	75	01
80	45	86	99	02	34	87	08	86	84	49	76	24	08	01	86	29	11
53	84	49	63	26	65	72	84	85	63	26	02	75	26	92	62	40	67
69	84	12	94	51	36	17	02	15	29	16	52	56	43	26	22	08	62
37	77	13	10	02	18	31	19	32	85	31	94	81	43	31	58	33	51

Source: Excerpted from *A Million Random Digits with 100,000 Normal Deviates* (New York: Free Press, 1955), p. 7, with permission of the Rand Corporation.