UNIVERSITY OF SWAZILAND

FACULTY OF COMMERCE

DEPARMENT OF BUSINESS ADMINISTRATION

FINAL EXAMINATION PAPER, FULL TIME & IDE STUDENTS

JUNE 2017

TITLE OF PAPER : MANAGEMENT SCIENCE11

COURSE CODE : BA 310 & BA 407

TIME ALLOCATED : THREE [3] HOURS

TOTAL MARKS : 100 MARKS

INSTRUCTIONS

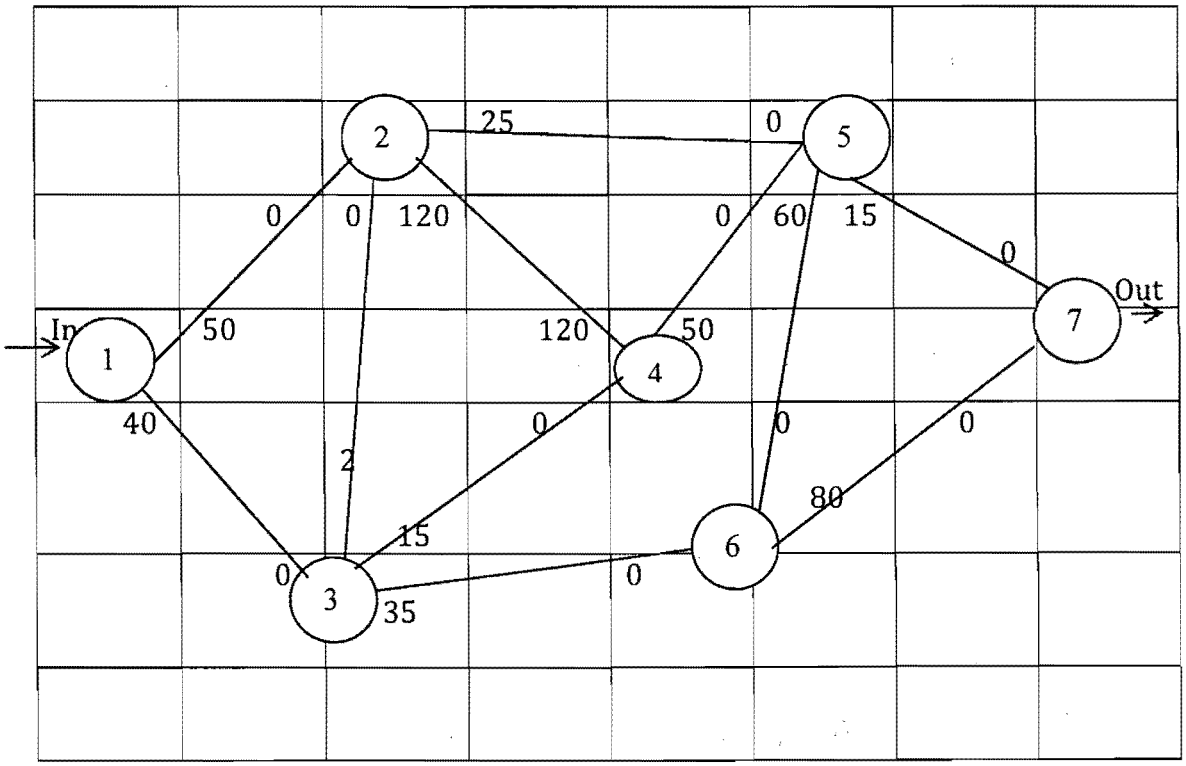
1. TOTAL NUMBER OF QUESTIONS IN THIS PAPER IS 5
2. ANSWER FOUR QUESTIONS OF YOUR CHOICE.
3. EACH QUESTION CARRIES 25 MARKS.
4. THE MARKS ALLOCATED FOR A QUESTION/PART OF A QUESTION ARE INDICATED AT THE END OF EACH QUESTION/PART OF QUESTION.
5. MAXIMUM MARKS WILL BE AWARDED FOR QUALITY, LAYOUT, ACCURACY, AND GOOD PRESENTATION.

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

QUESTION 1.

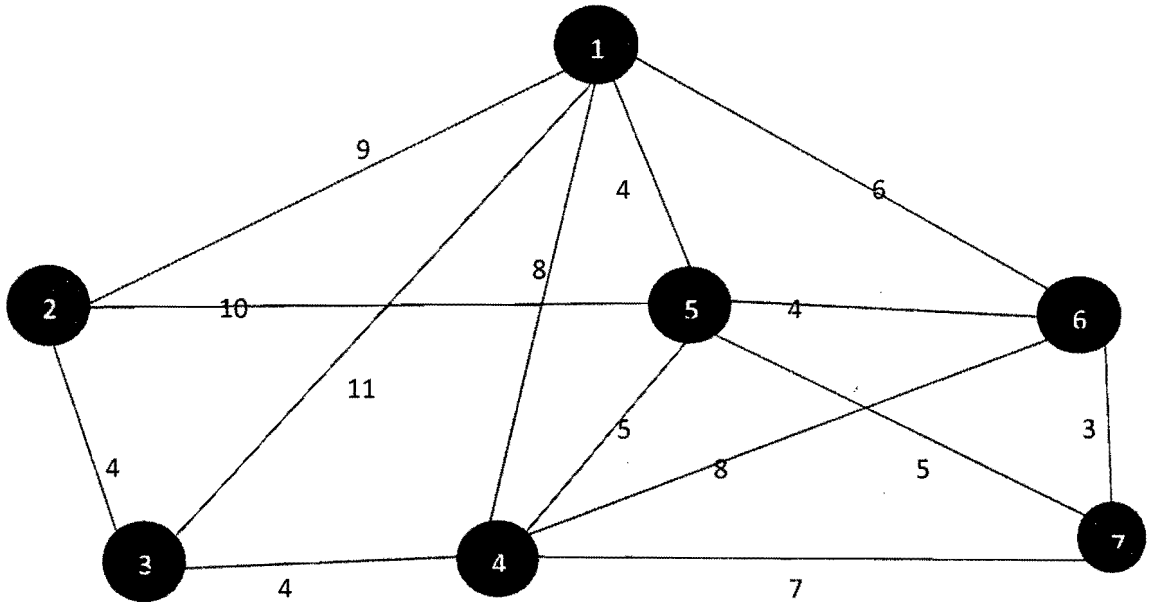
1.1. The South African Tourism Ministry is famous about its Kruger Park Game Reserve in Limpopo and Mpumalanga provinces. The unique park consists of a network of interconnecting routes that lead completely through the game reserve. This resembles a network. Because of limited capacity the park has to restrict the flow of tourists visiting the game park. The daily capacity of certain areas is very limited, yet tourist demand already exceeds the present limit.

Given flow patterns and capacitated branches shown in the network table below. Compute the maximum number of tourists that can be allowed to view animals in the game park without causing any problems. **[13 marks]**



1.2. A marketing company with offices in different centres around the country is developing a local area network to link seven shops' computer systems to the Chief Executive Officer's executive information system. The company's ICT department wants to design the LAN with the minimum length of cable.

The potential cable paths and their lengths in kilometres are shown in the network below. The suitable cable costs E 5,450.05 per kilometre. How much should be budgeted for the cable length for the above project? **[12 marks]**



[TOTAL MARKS 25]

QUESTION 2

A cattle farmer who does not produce any feedstock owns three fattening pens and relies on three commercial sources for his feedstock. The transportation problem faced by the farmer is to supply the required quantities of feedstock to each of the feeding panes, each with specific demands, from the three supply sources, each with specific production capacities, in such a way as to minimize total transportation cost. The transportation problem can be visualised in the transportation network shown below which shows the supply capacity of each source, demand requirements for each pane and unit transportation costs.

Supply	Sources	Unit cost(E)	Depot	Demand
150				200
	Lobamba	20	Manzini	
		6		
		2		
100		9		120
	Malkerns	10	Mangayane	
		15		
		5		
250		18		180
	Luyengo	12	Lavumisa	
500	Total supply		Total demand	500

2.1. Draw a transportation tableau for the farmer **(3 marks)**

2.2. What is the condition for using the stepping stone method in order to establish optimality in a transportation problem? **(2 marks)**

2.3. How do you determine optimality in a transportation problem? **(2 marks)**

2.4. Use the North West Corner and Vogel's Approximation methods in conjunction with the stepping stone method to determine the optimal solution for the above problem **(15 marks)**

2.5. Comment on the efficiency of the VAM and the North West Corner methods? **(3 marks)**

[TOTAL MARKS 25]

QUESTION 3

3.1. Write notes on the steps of the Hungarian method of assignment **(5 marks)**

3.2. How do you apply the Hungarian method to a maximization assignment problem? **(5 marks)**

3.3. Use the Hungarian method to solve the following assignment problem **(15 marks)**

Sanelisiwe is a pioneer in beauty care and cosmetology. Her company has developed into a national chain of personal sales forces known as "**Beauty Sanes**". The company now has regional sales offices where sales people are recruited, trained and assigned to specific territories. Management believe that the most important factor behind the success of a salesperson, and consequently the success of the company is effective assignment of each trained salesperson to a territory. The company's best source of information upon which to base this decision is performance education conducted during on-the job training. Recently one of the company's districts recruited and trained four salespeople. The new four salespeople were assigned to four sales territories on a monthly rotating basis. Each salesperson spent one month in each sales territory during the four months on the job training program. Because of differences in each salesperson's familiarity with each territory, as well as differences in their ability to deal with different types of customers, the time required to call on potential clients in each territory varies for each salesperson. These average times in minutes are:

	Sales Territory			
Salesperson	A	B	C	D
1	8	10	12	16
2	11	11	15	8
3	9	6	5	14
4	15	14	9	7

The District sales manager must assign these four salespeople to each of the four sales territories. As an incentive to develop the area, only one person is to be assigned to each territory. The basic decision problem, therefore, is to determine how each salesperson should be assigned in order to minimise the total time required to contact potential clients **[TOTAL MARKS 25].**

QUESTION 4

Car wash has become big business in Swaziland and John actually opened an outlet recently at Matsapha. Now he wants to determine efficiency levels at the centre. The centre is able to clean cars at an average of 3 units per hour or about 1 unit every 20

minutes. Customers who need carwash service arrive at the centre at an average of 2 per hour. If all the conditions of the single channel queuing model are met, calculate values of the following operating characteristics.

i. The average number of cars in the system(number in line plus number being served) [2]

ii. Average time customer spends in the system(time spent in line and time spent being served) [2]

iii. Average number of cars in the queue [2]

iv. Average time a customer spends waiting in the queue [2]

v. The probability that the service facility is busy [2]

vi. The per cent idle time(probability that there is no one in the system) [2]

vii. Explain the psychological factors of the queuing theory [13]

[TOTAL MARKS 25]

QUESTION 5.

The Faculty of Commerce at the University of Swaziland introduced a new course in Project Management which became so popular with all Faculties, such that the University Book Shop's book sales drastically went up. The Book shop management are aware of the advantages of keeping adequate stocks so that stocks do not run dry, however management is also worried about the costs of overstocking the prescribed book in case they hold too many copies in stock which will not be bought.

Analysis of sales for the Project Management text for the past 50 weeks reveals the following:

Sales per Week	Frequency
40	6
50	5
60	9
70	12
80	8
90	7
100	3

a. Discuss the advantages and disadvantages of simulation (10 marks)

b. The Book Shop has negotiated with the supplier to have the book printed locally so that it can be ordered at short notice. If the Book Shop maintains a constant supply of 80 books in any given week, how many times will the bookshop fail to meet demand in a 20 week simulation? Use random numbers from the 7th column of the attached table beginning with the random digits 10. (7 marks)

c. Determine the average number of book sales simulated per week over the 20 week period, including stock outs? (4 marks)

d. Will there be any difference in weekly sales if you used the expectation theory? (4 marks)

[TOTAL 25 MARKS]

END OF EXAM. GOOD LUCK!!!!!!

TABLE 15.5

Table of Random Numbers

52	06	50	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.