



MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF ECONOMICS

FIRST SEMESTER EXAMINATION FOR DEGREE IN

BACHELOR OF ECONOMICS AND FINANCE

BACHELOR OF ECONOMICS

EES 302: OPERATIONS RESEARCH 1

DATE: 9/8/2016

TIME: 2:00 – 4:00 PM

INSTRUCTIONS:

Answer Question One and any other two questions.

QUESTION ONE (COMPULSORY)

Regal investments has just received instructions from a client to invest in two shares; one an airline share, the other an insurance share. The total maximum appreciation in share value over the next year is to be maximized subject to the following restrictions:

- The total investment shall not exceed shs. 100,000
- At most sh 40,000 is to be invested in the insurance shares.
- Quarterly dividends must total at least sh 2, 6000.

The airline share is currently selling for sh. 40 per share and its quarterly dividend is sh. 1 per share. The insurance share is currently selling for sh. 50 per share and the quarterly dividend is sh. 1.50 per share. Regal's predict that over the next year, the value of the airline share will increase by sh. 2 per share and the value of the insurance by sh. 3 per share.

Required:-

- i) Formulate the above linear programming problem. (6 marks)
- ii) What are the major assumptions to the formulation in (i) above. (2 marks)
- iii) How should the clients' money be invested to satisfy the restrictions? (10 marks)
- iv) Interpret the shadow prices for the total Investments and Investments in Insurance shares. (6 marks)
- v) Formulate the dual problem corresponding to the problem in (i) above. Determine the solution to this dual problem. (6 marks)

QUESTION TWO

A company has four factories F_1 , F_2 , F_3 and F_4 manufacturing the same product. Production and raw material costs differ from factory, and are given in the following table in the first two rows. The transportation costs from the factories to sales depots S_1 , S_2 , S_3 are also given.

The last two columns in the table give the sale price and the total requirement at each depot. The production capacity of each factory is given in the last row.

		F1	F2	F3	F4	Sales Price Per unit	Requirements in Units
Production cost/unit		15	18	14	13		
Raw material cost/unit		10	9	12	9		
	S_1	3	9	5	4	34	80
Transportation	S_2	1	7	4	5	32	120
Cost per Unit:	S_3	5	8	3	6	31	150
		10	150	50	100		

Determine the most profitable distribution schedule and the corresponding profit. (20 marks)

QUESTION THREE

Excel Industries has four subsidiary companies whose accounts are to be audited. The company has short-listed five audit firms that can be assigned any of the audit tasks.

The table below shows the fees charged by the audit firms to audit the accounts of the respective subsidiary companies.

Audit firm	Subsidiary companies			
	Mayfair (Sh. Million)	Agrotech (Sh. Million)	Metro (Sh. Million)	Davtech (Sh. Million)
AB	5	10	16	10
CD	18	14	12	16
EF	10	13	14	12
GH	13	6	10	16
JK	14	11	8	13

Required:

- i) The assignment Excel Industries would make to minimize the total cost of auditing the subsidiary companies. (10 marks)
- ii) The audit firm which will not be assigned any task (5 mark)
- iii) The minimum cost of auditing the subsidiary companies (5 marks)

QUESTION FOUR

- a) Distinguish between CPM and PERT as techniques used in project planning. (4 marks)
- b) Outline and explain the major functions of project management. (6 marks)

- c) The time estimates in days for each activity in a project are as follows:

Activity	Completion time		
	Optimistic (a)	Most expected (m)	Pessimistic (b)
1 – 2	4	8	12
2 – 3	1	4	7
2 – 4	8	12	16
3 – 5	3	5	7
4 – 5	0	0	0
4 – 6	3	6	9
5 – 7	3	6	9
5 – 8	4	6	8
7 – 9	4	8	12
8 – 9	2	5	8
9 – 10	4	10	16
6 – 10	4	6	8

Using the above information:

- i) Determine the expected time for each activity and hence the critical path and the expected completion time (10 marks)

QUESTION FIVE

A Firm works 40 hours a week and has a capacity of overtime work to the extent of 20 hours in a week. It has received 7 orders to be processed on 3 machines, A, B and C in the order ABC, to be delivered in a week's time. The process times (in hours) are recorded in the following Table.

Job	1	2	3	4	5	6	7
Machine A	7	8	6	6	7	8	5
Machine B	2	2	1	3	3	2	4
Machine C	6	3	4	4	2	1	5

The manager, who, in fairness, insists on performing the jobs in the sequence in which they are received is refusing to accept an eighth order, which requires 7,2 and 5 hours, respectively on A, B and C machines, because according to him the eighth job would increase total processing time to 61 hours , which extends the firm's capacity. What is your advice to him? (20 marks)