



UNIVERSITY EXAMINATIONS 2018/2019
EXAMINATION FOR THE DEGREE OF BACHELOR OF BUSINESS
ADMINISTRATION AND BACHELOR OF COMMERCE
BMS 4307: OPERATIONS RESEARCH
END OF SEMESTER EXAMINATIONS

SERIES: AUGUST 2019
TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass, and student ID

This paper consists of five questions. Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

QUESTION ONE

(a) i.) Give a historical background of how Operations Research (OR) came into being. **(4 marks)**

ii.) Give a general format of linear programming model. **(4 marks)**

iii.) Explain the following terms as used in operation research

Finite calling units **(3 marks)**

Payoff

Critical activity

(b.) A food manufacturer processes two products, P and Q. P has a contribution of \$ 3 per unit and Q \$ 4 per unit. The Manufacturer wishes to establish the weekly production plan which maximises contribution. Production data are as follows:-

	Machinery Hour	Labour Hour	Material (Kgs)

	Per unit	Per unit	
P	4	4	1
Q	2	6	1
Total available per week	100	180	40

Because of a trade agreement, sales of P are limited to a weekly maximum of 20 units, and to honour an agreement with an old established customer at least 10 units of Q must be sold per week.

Required:

- i.) Formulate the problem as a linear programming model. **(4 marks)**
- ii.) Find the dual formulation of (i.) above. **(3 marks)**
- iii.) Drawing a graph and identify the feasible region **(5 marks)**
- (iv) Finding the optimal production point at maximum profit from the graph, **(3 marks)**

QUESTION TWO

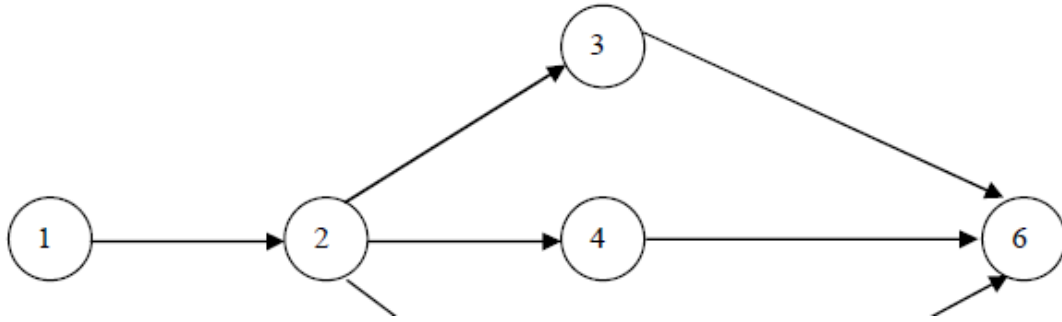
- a.) i.) Identify the following as used in Network analysis **(2 marks)**



- ii. Use the diagram below to answer the questions that follow **(2 marks)**

I. identify:

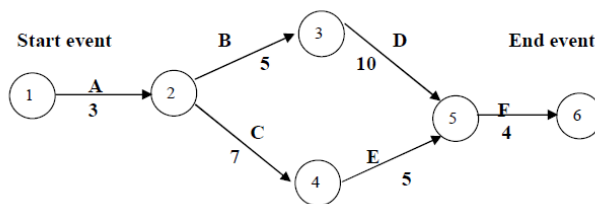
- i. successor event
- ii. predecessor event



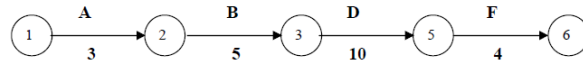
II. The following information is available regarding a project.

Activity	Predecessor Activity	Duration (Weeks)
A	-	3
B	A	5
C	A	7
D	B	10
E	C	5
F	D,E	4

a. Draw the network diagram for the project **(4marks)**

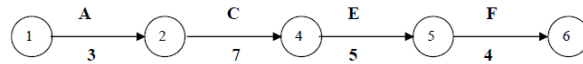


b. Determine the critical activities and the project completion time **(4 marks)**



with a time of $3 + 5 + 10 + 4 = 22$ weeks.

Path II



with a time of $3 + 7 + 5 + 4 = 19$ weeks.

Compare the times for the two paths. Maximum of $\{22, 19\} = 22$. We see that path I has the maximum time of 22 weeks. Therefore, path I is the critical path. The critical activities are A, B, D and F. The project completion time is 22 weeks.

We notice that C and E are non-critical activities.

Time for path I - Time for path II = $22 - 19 = 3$ weeks.

Therefore, together the non-critical activities can be delayed upto a maximum of 3 weeks, without delaying the completion of the whole project.

QUESTION THREE

a.) Define the following terms:-

-sensitivity of a solution

(3 marks)

-robustness of a solution

(3 marks)

b.) A company can produce three products, A, B and C. The product yields a contribution of \$8, \$5 and \$10 respectively. The products use a Machine which has 400 hours capacity in the next period. Each unit of the product uses 2, 3, and 1 hour respectively of the Machine's capacity. There are only 150 units available in the period of a special component which is used singly in products A and C. 200 kgs only of a special alloy is available in the period. Product A uses 2 kgs per unit and product C uses 4 kgs per unit. There is an agreement with a trade association to produce no more than 50 units of product B in the period. The company wishes to find out the product plan which maximise contribution.

Required:

i.) Set up the initial Simplex Tableau including the necessary slack variables, and use it to find the optimal solution. **(12 marks)**

ii.) Interpret the final tableau of the simplex solution. **(4 marks)**

QUESTION FOUR

a.) Explain the objectives of inventory control **(8 marks)**

b.) The following data relate to a given stock items:

Normal Usage 110 per day

Minimum Usage	50 per day
Maximum Usage	140 per day
Lead time	25-30 days
EOQ	50,000

Calculate the following control levels

- i.) Re-order Level **(4 marks)**
- ii.) Minimum Level **(4 marks)**
- iii.) Maximum Level **(4 marks)**

QUESTION FIVE

- a.) Discuss the factors considered during product design analysis **(8 marks)**
- b.) State the assumptions of game theory. **(12 marks)**