

**(University of Choice)**

**MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**(MMUST)**

**UNIVERSITY SUPPLEMENTARY EXAMINATIONS**

**2018/2019 ACADEMIC YEAR**

**SECOND YEAR SECOND SEMESTER EXAMINATION**

**FOR THE DEGREE**

**OF**

**BACHELOR OF COMMERCE**

**COURSE CODE: BCB206**

**COURSE TITLE:**  **MANAGEMENT DECISION MODELS**

**DATE: FRIDAY, 27/09/2019**  **TIME: 8.00 AM- 10.00AM**

**INSTRUCTIONS TO CANDIDATES**

Answer question **ONE** and any other **TWO** questions

TIME: **2 HOURS**

MMUST observes ZERO tolerance to examination cheating

This paper consists of 4 printed pages. Please Turn Over.

**QUESTION ONE (COMPULSORY) (30 MARKS)**

1. Regardless of the way one defines linear programming, certain basic requirements are necessary before this technique can be employed into business problems. What are these basic requirements in formulation? Explain briefly. (5 marks)
2. An Investor is given the following investment alternatives and percentage rates of return had high market increases

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | |  | | --- | | **States of Nature (Market Conditions)** | | | |
| **Low** | **Medium** | **High** |
| Regular shares | 7% | 10% | 15% |
| Risky shares | -10% | 12% | 25% |
| Property | -12% | 18% | 30% |

Over the past 300 days, 150 days have been medium market conditions and 60 days have had high market increases. On the basis of these data state the optimum investment strategy for the investment. (10 marks)

1. Write the dual of the following primal Linear Programming problem

Maximize: z = x1-3x2 -2x3

Subject to the constraints: 3x1-x2+2x3< 7

2x1-4x2>12

-4x1+3x2+8x3= 10

X1, x2> 0; x3 unrestricted in sign (5 marks)

1. A department of a company has five employees with five jobs to be performed. The time in hours that each employee takes to perform each job is given in the effectiveness matrix.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Ken | Lynn | Jude | Steve | Kevo |
| Job A | 10 | 5 | 13 | 15 | 16 |
| Job B | 3 | 9 | 18 | 13 | 6 |
| Job C | 10 | 7 | 2 | 2 | 2 |
| Job D | 7 | 11 | 9 | 7 | 12 |
| Job E | 7 | 9 | 10 | 4 | 12 |

1. How should the jobs be allocated one per employee so as to maximize the total man-hours? (7 marks)
2. Determine also the earning of each employee given that each employee is paid at a rate of ksh 1500 per hour. (3 marks)

**QUESTION TWO (20 MARKS)**

1. How does the PERT technique help a business manager in decision-making? (5 marks)
2. The following table gives the activities in a construction project and also gives other relevant information:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Activity | Immediate predecessor | Time(months) | | Direct Cost Ksh ‘000’ | |
| Normal | Crash | Normal | Crash |
| A | - | 4 | 3 | 60 | 90 |
| B | - | 6 | 4 | 150 | 250 |
| C | - | 2 | 1 | 38 | 60 |
| D | A | 5 | 3 | 150 | 250 |
| E | C | 2 | 2 | 100 | 100 |
| F | A | 7 | 5 | 115 | 175 |
| G | D,B,E | 4 | 2 | 100 | 240 |

Indirect costs vary as follows:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Months | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 |
| Cost Ksh | 600 | 500 | 400 | 250 | 175 | 100 | 75 | 50 | 35 | 25 |

1. Draw an arrow diagram for the project. (5 marks)
2. Determine the project duration that will result in minimum total project. ( 10 marks)

**QUESTION THREE (20 MARKS)**

1. An advertising company wishes to plan an advertising campaign for three different media: television, radio and a magazine. The purpose of the advertising is to reach as many potential customers as possible. The following are the results of a market study.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Television | | Radio | Magazine |
| Prime day | Prime time |
| Cost of an advertising unit | 40,000 | 75,000 | 30,000 | 15,000 |
| Number of potential customers reached per unit | 400,000 | 900,000 | 500,000 | 200,000 |
| Number of women customers reached per unit | 300,000 | 400,000 | 200,000 | 100,000 |

The company does not want to spend more than Ksh 800,000 on advertising. It is further required that;

1. At least 2 million exposures take place amongst women
2. The cost of advertising on television be limited to Ksh 500,000
3. At least 3 advertising units be bought on prime day and two units during prime time.
4. The number of advertising units on the radio and the magazine should each be between 5 and 10

***Required***

Formulate this problem as an LP model to maximize potential customer reach (10 marks)

In a railway marshaling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the interval time follows an exponential distribution and the service time (the time taken to hump a train) distribution is also exponential with an average of 36 minutes. Calculate;

1. Expected queue size (line length)
2. Probability that the queue size exceeds 10. If the input of trains increases to an average of 33 per day, what will be the change in (i) and (ii)? (10 marks)

**QUESTION FOUR (20 MARKS)**

Use simplex method to solve the following LP problem

Maximize Z = 3x1+5x2+4x3

Subject to the constraints: i) 2x1+3x2< 8 ii) 2x2+5x3< 10 iii) 3x1+2x2+4x3< 15 x1, x2, x3>0

**QUESTION FIVE (20 MARKS)**

Coca-Cola Company is contemplating the introduction of a revolutionary new product with new packaging or replacing the existing product at much higher price (S1). It may even make a moderate change in the composition of the existing product, with a new packaging at a small increase in price (S2), or may make a small change in composition of the existing product, backing it with the word’ New’ and a negligible in increase in price ( S3). The three possible states of nature or events are: i) high increase in sales (N1), ii) no change in sales (N2) and iii) decrease in sales (N3). The marketing department of the company worked out the payoffs in terms of yearly net profit for each of the strategies of three events (expected sales). This is represented in the following table.

|  |  |  |  |
| --- | --- | --- | --- |
| **STRATEGIES** | **STATES OF NATURE** | | |
| **N1** | **N2** | **N3** |
| **S1** | 700,000 | 300,000 | 150,000 |
| **S2** | 500,000 | 450,000 | 0 |
| **S3** | 300,000 | 300,000 | 300,000 |

Which strategy should the concerned executive choose on the basis of

1. Maximum criterion (5 marks)
2. Maximax criterion ( 5 marks)
3. Minimax regret criterion (5 marks)
4. Laplace criterion ( 5 marks)

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