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**GARISSA UNIVERSITY**

**UNIVERSITY EXAMINATION 2020/2021 ACADEMIC YEAR THREE**

**SECOND SEMESTER EXAMINATION**

**SCHOOL OF BUSINESS AND ECONOMICS**

**FOR THE DEGREE OF BACHELOR OF BUSINESS MANAGEMENT**

**COURSE CODE: ECO 314**

**COURSE TITLE: QUANTITATIVE METHODS**

**EXAMINATION DURATION: 2 HOURS**

**DATE: 02/04/2021 TIME: 09.00-11.00 AM**

**INSTRUCTION TO CANDIDATES**

* **The examination has FIVE (5) questions**
* **Question ONE (1) is COMPULSORY**
* **Choose any other TWO (2) questions from the remaining FOUR (4) questions**
* **Use sketch diagrams to illustrate your answer whenever necessary**
* **Do not carry mobile phones or any other written materials in examination room**
* **Do not write on this paper**

**This paper consists of FOUR (4) printed pages *please turn over***

**QUESTION ONE (COMPULSORY)**

1. Define the following terms as used in quantitative methods
2. Linear programming model (LP Model) (2 marks)
3. Feasible solution (1 mark)
4. Optimal solution (1 mark)
5. Suppose that of all individuals buying a certain digital camera, 60% include an optional memory card in their purchase, 40% include a set of batteries and 30% include a card and a set of batteries. A buyer is selected at random. Let A={memory card purchased} and B={batteries purchased). Find (i) P( $A∕B)$ $P({B}/{A})$ (5 marks)
6. Three different machines in a factory have the following probabilities of breaking down during a shift

|  |  |  |  |
| --- | --- | --- | --- |
| Machine | A | B | C |
| Probability | $$\frac{4}{15}$$ | $$\frac{3}{10}$$ | $$\frac{2}{11}$$ |

Find the probability that in a particular shift

1. All the machines will break down (2 marks)
2. None of the machines will break down (2 marks)
3. Basco paints company produces both interior and exterior paints from two raw materials, $M\_{1}$ and $M\_{2}$. The table below provides the basic data for the problem

|  |  |  |
| --- | --- | --- |
|  | Tons of raw material | Maximum daily available tons |
| Exterior paint | Interior paint |
| $$M\_{1}$$ | 6 | 4 | 24 |
| $$M\_{2}$$ | 1 | 2 | 6 |
| Profit per ton (sh) | 5 | 4 |  |

A market survey indicates that the daily demand for interior paint cannot exceed that of exterior paint by 1 ton. The maximum daily demand for interior paint is 2 tons. The company wants to determine the optimum product mix for interior and exterior paints that maximizes the daily profit. Let $X\_{1} $and $X\_{2}$ represent the tons of exterior and interior paints produced respectively

1. Formulate the objective function (11 marks)
2. State all the inequalities in this problem (6 marks)
3. Explain what is meant by input output analysis (2 marks)
4. The following are prices of shares of Ngamia Company Limited. Find the range and the coefficient of range (3 marks)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Day | Mon | Tue | Wed | Thu | Fri | Sat |
| Price (ksh) | 200 | 210 | 208 | 160 | 200 | 250 |

1. Calculate the mean deviation and its coefficient from the data below

Income (ksh): 4400 3000 5800 4600 4000 4200 3000 (4 marks)

**QUESTION TWO (20 MARKS)**

A company manufactures two products, $X and Y $by using three machines, $A, B and C. $ Machine A has four hours of capacity available during the coming week. Similarly, the available capacity of machines B and C during the coming week is 24 hours and 35 hours respectively. One unit of product X requires one hour of machine A, 3 hours of machine B and 10 hours of machine C. similarly, one unit of product Y requires 1 hour, 8 hours and 7 hours of machines A , B and C respectively. When one unit of X is sold in the market, it yields a profit of sh 50 per product and that of Y is sh 70 per unit. Use graphical method to solve this problem and and find the optimal product mix. Let $x and y $be the units of $X and Y$to be produced by the company and find the maximum profit. (20 marks)

**QUESTION THREE (20 MARKS)**

1. Discuss the two types of Input-Output Analysis and state four purposes of Input-Output Analysis (6 marks)
2. The table below gives the input-output coefficients for a three sector economy consisting of Agriculture, Industry and Services

|  |  |
| --- | --- |
| From | To |
| Agriculture | Industry | Services |
| Agriculture | 0.3 | 0.4 | 0.2 |
| Industry | 0.2 | 0.0 | 0.5 |
| Services | 0.1 | 0.3 | 0.1 |

The projected forecast demand for the three sectors are 100, 40 and 50 million shillings (the coefficient matrix is given in terms of money). Determine what gross outputs of the three sectors will meet this demand. (14 marks)

**QUESTION FOUR**

1. State Baye’s theorem
2. At a certain assembly plant, three machines, $A, B, C$ make 30%,45% and 25% respectively of the products. It is known from past experience that 2%, 3% and 2& of the products made by each machine respectively are defective. Suppose a finished product is selected at random, what is the probability that it is defective? If a product were chosen randomly and found to be defective, what is the probability that it was made by machine C?
3. A discrete random variable $X,$ has probability mass function given by the table below

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| $$X$$ | 0 | 1 | 2 | 3 | 4 |
| $$P(X=x)$$ | $$k$$ | $$2k$$ | $$5k$$ | $$10k$$ | $$17k$$ |

Find $k$ and hence compute $P(1\leq X<3)$ (3 marks)

1. The probability distribution of a random variable $X $ is given below

|  |  |  |  |
| --- | --- | --- | --- |
| $$X$$ | 0 | 1 | 2 |
| $$P(X=x)$$ | $$\frac{1}{6}$$ | $$\frac{1}{2}$$ | $$\frac{1}{3}$$ |

Find the mean and standard deviation of (i) $X$ (ii) $12X+6$ (9 marks)

**QUESTION FIVE (20 MARKS)**

1. Define **decision** and state the five steps of Decision- Making Process (7 marks)
2. A businessman has three alternatives open to him each of which can be followed by any of the four possible events. The conditional payoffs (in sh) for each action-event-combination are given below

|  |  |
| --- | --- |
| Alternative | Payoffs conditional on events |
| A | B | C | D |
| X | 8 | 0 | -10 | 6 |
| Y | -4 | 12 | 18 | -2 |
| Z | 14 | 6 | 0 | 8 |

Determine which alternative should the businessman choose if he adopts the

1. Minimax criterion (1 marks)
2. Maximax criterion (1 mark)
3. Hurwicz criterion , his degree of optimism being 0.7 (1 mark)
4. Laplace criterion (5 marks)
5. Minimax regret criterion (5 marks)