

**MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**P.O. Box 972-60200 – Meru-Kenya**

**Tel: 020-2069349, 061-2309217. 064-30320 Cell phone: +254 712524293, +254 789151411**

**Fax: 064-30321**

**Website:** [**www.must.ac.ke**](http://www.must.ac.ke) **Email:** [**info@must.ac.ke**](mailto:info@must.ac.ke)

**University Examinations 2015/2016**

SECOND YEAR, SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF PURCHASING AND SUPPLIES MANAGEMENT

**SMB 3275: QUANTITATIVE METHODS II**

**DATE: November, 2015 TIME: HOURS**

**INSTRUCTIONS:** *Answer questions* ***one Compulsory*** *and any other* ***two*** *questions*

**QUESTION ONE - (30 MARKS)**

1. Define a matrix and give one example of a two by three matrix. (2 Marks)
2. Given that matrices A and B are such that B.C = A and that

A= and B =

Find matrix C and state its order. (5 Marks)

1. The total cost function of a given product is given by

+ 15750x + 18000

where x is the number of units produced. Determine;

1. The marginal cost function (1 Mark)
2. The number of units that must be produced to minimize the total cost. Find this minimum total cost. (5 Marks)
3. The marginal revenue function of a commodity is given as

MR= 12 - +4x. Find the total revenue function and the corresponding demand function. (4 Marks)

1. In a certain locality there are two petrol stations BP and total. In the month of April the market shares were 60% and 40% respectively. You are provided with the following transition matrix which may be presumed to be stable.

BP Total

BP 0.7 0.3

Total 0.2 0.8

1. Interpret the values of 0.2 along the BP column and 0.3 along the BP row of the transition matrix. (2 Marks)
2. Determine the market share in the month of June. (3 Marks)
3. Determine the long-run equilibrium market share. (4 Marks)

|  |  |  |  |
| --- | --- | --- | --- |
|  | Infavour (A) | Against (B) | Totals |
| Male (M) | 15 | 45 | 60 |
| Female (F) | 4 | 36 | 40 |
| Total | 19 | 81 | 100 |

1. 100 employees of a company were asked if they were in favour of or against paying high salaries to their C.E.O’s of their companies. The following data shows their response.

The conditional probability of a event A given event M is written a P (A/M).

Determine;

1. P (A/M) ( 1 Mark)
2. P ( B/F) (1 Mark)
3. One employee is picked at random, find the probability that he is male and he is against higher salaries for C.E.O’s. (2 Marks)

**QUESTION TWO (20 MARKS)**

1. Find from first principles the derivative of (4 Marks)
2. There are three industries in an economy. Their input-output (technical coefficient matrix) is given below.

A =

1. Find, where I is the identity matrix. (2 Marks)
2. Find , that is the inverse of (8 Marks)
3. If the final demand is given by the matrix , calculate the final output matrix

(2 Marks)

1. Given that the total Revenue function for a blender machine is R(x) = 36x – where x is the number of units sold. Determine the average rate of change in reveneue R(x) as x increases from 10 to 20 units. (4 Marks)

**QUESTION THREE ( 20 MARKS)**

1. Given that and that
2. Find (2 Marks)
3. Find where is the partial derivative with respect to t. (2 Marks)
4. (i) Find the inverse of the matrix (3 Marks)

(ii) In a certain week a businessman bought 36 bicycles and 32 radios for a total of Ksh 227,280. In the following week, he bought 28 bicycles and 24 radios for a total of Ksh 174,960. Using matrix method, find the price of each bicycle and each radio that he bought. (4 Marks)

1. In the third week, the price of each bicycle was reduced by 10% while the price of each radio was raised by 10%. The businessman bought as many bicycles and as many radios as he had bought in the first two weeks. Find by matrix method the total cost of the bicycles and radios that the businessman bought in the third week.

(5 Marks)

1. Given that , find giving your answer in descending powers of x. What are the values of x for which the gradient , is zero. (4 Marks)

**QUESTION FOUR (20 MARKS)**

1. Given that a firm has total cost function given by the equation

and the corresponding revenue function given by

R(x) = 100x - . Determine the profit function and hence find the marginal profit when 20 units of the product are produced and sold. (6 Marks)

1. A survey showed that 30% of university students pay their fees in full before the deadline. If 10 students were selected at random, Determine the probability that;
2. None will have paid fees in full
3. Exactly three will have paid in full
4. At least one has paid in full. (8 Marks)
5. (i) Explain the term “steady state” (Equilibrium) as used in Markov process. (3 Marks)

(ii) Explain three characteristics of markov process. (3 Marks)

**QUESTION FIVE (20 MARKS)**

1. What is variance as used when analyzing data? (1 Mark)
2. Consider the data given below from a sample of 80 items whose weights are grouped in classes.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Weight(g) | 110-119 | 120-129 | 130-139 | 140-149 | 150-159 | 160-169 | 170-179 | 180-189 |
| Frequency f | 5 | 7 | 12 | 20 | 16 | 10 | 7 | 3 |

Using a provisional mean (Assumed mean) of 154.5 or otherwise, calculate;

1. The arithmetic mean of the sampled items. (3 Marks)
2. The standard deviation and hence the co-efficient of variation of the data

(3 Marks)

1. The median of the data. (3 Marks)
2. Using the formula mode = 3x median – 2x arithmetic mean, determine the mode of the given data. (2 Marks)
3. What is the variance of the given data? (1 Mark)
4. In the following table are recorded data showing the test scores made by ten salesmen on an intelligence test and their weekly sales in thousands of shillings.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Salesman | A | B | C | D | E | F | G | H | I | J |
| Test score x | 40 | 70 | 50 | 60 | 80 | 50 | 90 | 40 | 60 | 60 |
| Sales y(sh 000) | 2.5 | 6.0 | 4.0 | 5.0 | 4.0 | 2.5 | 5.5 | 3.0 | 4.5 | 3.0 |

1. Calculate the regression line of sale (y) on test score(x) given that mean of x is 60 and mean of y is 4.0 (5 Marks)
2. Use the regression line to estimate the probable weekly sales volume for a salesman whose test score is 100. (2 Marks)