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**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: AUGUST 2016 TIME: 2 HOURS**

**INSTRUCTIONS:** *Answer question* ***one*** *and any other* ***two***questions.

**QUESTION ONE (30 MARKS)**

1. The demand for a product in a certain firm varies with the price of the product. Through a survey conducted by the firm, it was established that the annual total revenue R [stated in $ 1,000s] is a function of the price p [stated in $] as given below.



Determine

1. The price which the firm should charge in order to maximize the total revenue. (2 marks)
2. The maximum annual revenue the firm will realize (1 mark)
3. From the information given below, find the most likely price of a litre of diesel in Nairobi if the corresponding price of a litre of diesel in Mombasa is Shs.70.

|  |  |  |
| --- | --- | --- |
| Average price of a litre of Diesel standard deviation | Mombasa | Nairobi |
| 65 | 67 |
| 2.5 | 3.5 |

The correlation coefficient between the price of a litre of diesel in the two cities is 0.8. (4 marks)

1. In a certain restricted market, there are two products A and B whose market share in the month of July was 50% each. The monthly transition matrix of the market is as given below.

|  |  |  |
| --- | --- | --- |
|  | To | |
| From | A | B |
| A | 0.9 | 0.1 |
| B | 0.5 | 0.5 |

1. Explain what the value of 0.5 along column A and 0.1 along column B of the transition matrix represent. (2 marks)
2. Determine their market share in the month of August. (2 marks)
3. An economy consists of a farmer, tailor and a carpenter who provides food, clothing and furniture respectively. The farmer consumes 30% of the food and the balance is shared equally the tailor and the carpenter. The clothing produced by the tailor is equally shared equally by the three. The carpenter consumes 20% of the furniture while the tailor consumes 50%. The balance is consumed by the farmer.

**Required:**

1. Determine the technical coefficient matrix for the above economy. (2 marks)
2. Determine the Leontief matrix (2 marks)
3. The marginal revenue function of a commodity is given as , where Q is the number of units of the commodity sold.
4. Find the total revenue function (2 marks)
5. Determine the demand function of the commodity. (2 marks)
6. A random sample of 10 items is taken and is found to have a mean weight of 60 grams and a standard deviation of 12 grams. At 95% confidence, find the limits within which the mean weight of all the items lie. (3 marks)
7. 100 employees of SONI company were asked if they were in favour of or against increasing the salary of their C.E.O . The following table shows a summary of their responses.

|  |  |  |
| --- | --- | --- |
| Gender of the employee | In favour | Against |
| Male | 15 | 45 |
| Female | 4 | 36 |

If an employee was picked at random, determine

1. The probability that the employee will be in favour of the increment given that the employee is a male. (2 marks)
2. The probability that the employee will be against the increment given that the employee is a female. (2 marks)
3. A sales manager of Jubilee insurance agency claims that the salesmen are averaging no more than 15 sales per week. A check on her claim based on 36 salesmen selected randomly revealed a mean of 17 sales per week with a variance of 9. Establish whether the evidence contradicts the sales manager claim (use  (4 marks)

**QUESTION TWO (20 MARKS)**

1. In a certain locality, there are only two petrol stations, Shell and Total. In the month of April this year, their market shares were 60% and 40% respectively. Provided below is the monthly transition matrix which is presumed to be stable.

Shell

Total

Shell

Total



Required:

1. Interpret the transition matrix in terms of retention and loss (2 marks)
2. Determine their market share in June (2 marks)
3. Find their market in the long-run. (6 marks)
4. An input-out matrix for two commodities X and Y is as given below

X

Y

Y

X



1. If the production capacity of commodity X is Shs.15M and that of commodity Y is Sh.20M, determine the internal consumption of each commodity. (2 marks)
2. Determine how much of each must be produced so as to have 5 million worth commodity X and 8 million worth of commodity Y available for external use. (6 marks)
3. Distinguish between a closed input-output model and an open input-output model. (2 marks)

**QUESTION THREE (20 MARKS)**

1. For a new product, the manufacturer spends Shs.100, 000 on the infrastructure. The variable cost is estimated as Sh.150 per unit of the product. The sale price per unit is Sh.200.

Determine

1. The cost function (2 marks)
2. The revenue function (1 mark)
3. The profit function (2 marks)
4. The break-even point (2 marks)
5. The total cost function of a product is given by



Where Q is the number of units of the product produced. Determine the number of units that must be produced so as to minimize the total cost. (5 marks)

1. A manufacturer’s marginal revenue function is given by

. Find the increase in manufacturer’s total revenue if the production is increased from 10 to 20 units. (4 marks)

1. The marginal cost function of manufacturing X units of a product is



If the total cost of producing 5 items is Shs.500, find the total cost function (4 marks)

**QUESTION FOUR (20 MARKS)**

1. The following table shows the data recorded on test scores made by ten salesmen on 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 “shs. 000” | 2.5 | 6.0 | 4.0 | 5.0 | 4.0 | 2.5 | 5.5 | 3.0 | 4.5 | 3.0 |

1. Given that  and , determine the regression equation of sales on test scores. (8 marks)
2. Estimate the weekly sales for a salesman whose test score is 10. (2 marks)
3. A firm is supplied with components from three sources, A, B and C. 50% of it came from A, 30% from B and 20% from C. It is found that 10% of the components supplied by A are defective, 5% of those supplied by B are defective, whereas 6% of those supplied by C are defective.
4. If a component is picked at random, what is the probability that it came from C or A. (2 marks)
5. If a component is picked at random, what is the probability that it is not defective.

(4 marks)

1. If however a component picked at random is first examined and is found to be defective, what is the probability that it will be from source A. (4 marks)

**QUESTION FIVE (20 MARKS)**

1. Distinguish between Type I and Type II errors. (2 marks)
2. A sales analyst thinks that the mean value of orders received by his firm is Ksh.26,000. He randomly selects a sample of 36 accounts and finds that a mean of Ksh.24,000 and a standard deviation of Ksh.45,000. Does this evidence support his belief? (5 marks)
3. A company offers five services at different costs. The company’s management requested the customers to rank the services according to quality and cost. The table below shows the results obtained.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Service | A | B | C | D | E |
| Quality Ranking | 2 | 5 | 1 | 3 | 4 |
| Cost Ranking | 1 | 3 | 2 | 4 | 5 |

Using Spearman’s rank correlation coefficient, establish whether there is a relationship between the quality of the service and its cost. (4 marks)

1. Annual sales of Brand Y over the last eleven years have been as follows:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Year | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
| Unit sale (“000s) | 50 | 59 | 46 | 54 | 65 | 51 | 60 | 70 | 56 | 66 | 76 |

Required:

1. Calculate a three-year moving average trend (5 marks)
2. Plot the series and trend on the same axes. (2 marks)
3. Produce a sale forecast for 1994. (2 marks)