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UNIVERSITY EXAMINATIONS 2022/2023 ACADEMIC YEAR
FIRST YEAR FIRST SEMESTER MAIN EXAMINATION
FOR THE DEGREE OF
MASTER OF BUSINESS ADMINISTRATION

COURSE CODE: MBA 804

COURSE TITLE: QUANTITATIVE ANALYSIS

DATE: 16/08/2023

TIME: 8:00AM -11:00AM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other Three Questions

TIME: 3 Hours

This Paper Consists of 6 Printed Pages. Please Turn Over.

QUESTION ONE (40 MARKS)

- (a) Differentiate between the terms Differentiation and integration (2mks)
- (b) A certain NGO carried out a survey in a certain community in order to establish the average at which the girls are married. The results of the survey indicated that the marriage age for the girls is 19 years. In order to establish the validity of the mean marital age, a sample of 50 women was interviewed and the average age indicated that they got married at the age of 16 years. However the different ages at which they were married differed with the standard deviation of 2.1years. The sample data indicates that the marital age is less 19 years. Is this conclusion true or not?Conduct a statistical test to either support the above conclusion drawn from the sample statistics i.e. the marriage age is less than 19 years, use a level of significance of 5% (10mks)

- (c) Solve the equations (3mks)

$$2x + 3y = 13$$

$$3x + 2y = 12$$

- (d) Find the derivatives of the following functions with respect to x

$$\frac{x}{3x + 7} \quad (4mks)$$

- (e) Outline procedure involved in hypothesis testing

- (f) Find the following $\int(x^{3/4} + 3/7 x^{-1/2} + x^5)$ (3mks)

- (g) State the merits and demerits of mean as a measure of central tendency (4mks)

- (h) From past experience a machine is known to be set up correctly on 90% of occasions. If the machine is set up correctly then 95% of good parts are expected but if the machine is not set up correctly then the probability of a good part is only 30%.On a particular day the machine is set up and the first component produced and found to be good. What is the probability that the machine is set up correctly. (5mks)

- (i) The following table shows the part-time rate per hour of a given no. of laborers in the month of June 1997.

Rate per hr. (x) Shs.	230	400	350	450	200	150
No. of Labourers	7	6	2	1	8	11

Calculate the standard deviation from the above table showing how the hourly payment were varying from the respective mean (5mks)

- (j) In a given farm located in the UK the average salary of the employees is £ 3500 with a standard deviation of £150. The same firm has a local branch in Kenya in which the average salaries are Kshs 8500 with a standard deviation of Kshs.800. Determine the coefficient of

variation in the 2 firms and briefly comment on the degree of dispersion of the salaries in the 2 firms.(4mks)

QUESTION TWO (20 MARKS)

(a) In a beauty competition 2 assessors were asked to rank the 10 contestants using the professional assessment skills. The results obtained were given as shown in the table below

Contestants	1 st assessor	2 nd assessor
A	6	5
B	1	3
C	3	4
D	7	6
E	8	7
F	2	1
G	4	8
H	5	2
J	10	9
K	9	10

Required: Calculate the rank correlation coefficient and hence comment briefly on the value obtained (5mks)

(b) The following data was obtained during a social survey conducted in a given urban area regarding the annual income of given families and the corresponding expenditures.

Family	(x)Annual income £ 000	(y)Annual expenditure £ 000
A	420	360
B	380	390
C	520	510
D	610	500
E	400	360
F	320	290
G	280	250
H	410	380
J	380	240
K	300	270
Total	4020	3550

Required: Calculate the product moment correlation coefficient briefly comment on the value obtained (6mks)

(c) An investment company advertised the sale of pieces of land at different prices. The following table shows the pieces of land their acreage and costs

Piece of land	(x) Acreage Hectares	(y) Cost £ 000
A	2.3	230
B	1.7	150
C	4.2	450
D	3.3	310
E	5.2	550
F	6.0	590
G	7.3	740
H	8.4	850
J	5.6	530
	$\Sigma x = 44.0$	$\Sigma y = 4400$

Required: Determine the regression equations of

- i. y on x and hence estimate the cost of a piece of land with 4.5 hectares (7mks)
- ii. Estimate the expected average if the piece of land costs £ 900,000 (2mks)

QUESTION THREE (20 MARKS)

- (a) Find $A + B$ And $A - B$, given the following matrices (2mks)

$$A = \begin{pmatrix} 6 & -1 & 10 & 5 \\ 3 & 4 & 2 & -5 \\ -9 & -13 & -6 & 0 \end{pmatrix} \quad B = \begin{pmatrix} 12 & 4 & -7 & 3 \\ 0 & -4 & 10 & -4 \\ 7 & -3 & 7 & 9 \end{pmatrix}$$

- (b) Find the determinant, inverse of the coefficient matrix formed from the following system of linear equations and use a suitable matrix method to solve. (8mks)

$$4x + 2y + 3z = 4$$

$$5x + 6y + 1z = 2$$

$$2x + 3y = -1$$

- (c) There are three types of breakfast meal available in supermarkets known as brand BM1, brand BM2 and Brand BM3. In order to assess the market, a survey was carried out by one of the manufacturers. After the first month, the survey revealed that 20% of the customers purchasing brand BM1 switched to BM2 and 10% of the customers purchasing brand BM1 switched to BM3. similarly, after the first month of the customers purchasing brand BM2, 25% switched to BM1 and 10% switched to BM3 and of the customers purchasing brand BM3 0.05% switched to BM1 and 15% switched to BM2. Required:

- i. Display in a matrix S, the patterns of retention and transfers of customers from the first to the second month, expressing percentage in decimal form.
(2mks)
- ii. Multiply matrix S by itself (that is form S^2) (5mks)
- iii. Interpret the results you obtain in part ii with regard to customer brand loyalty (3mks)

QUESTION FOUR (20 MARKS)

- (a) Differentiate between the terms Combinations and permutations
- (b) In a class of 100 students, 36 are male and studying accounting, 9 are male but not studying accounting, 42 are female and studying accounting, 13 are female and are not studying accounting. Use these data to deduce probabilities concerning a student drawn at random. $P(M)$, $P(A)$, $P(F \text{ and } \bar{A})$ and $P(A / M)$
(5mks)

	Accounting A	Not accounting \bar{A}	Total
Male M	36	9	45
Female F	42	13	55
Total	78	22	100

- (c) A medical survey was conducted in order to establish the proportion of the population which was infected with cancer. The results indicated that 40% of the population were suffering from the disease. A sample of 6 people was later taken and examined for the disease. Find the probability that the following outcomes were observed
 - Only one person had the disease (1mk)
 - Exactly two people had the disease (1mk)
 - At most two people had the disease (2mks)
 - At least two people had the disease (2mks)
 - Three or four people had the disease (2mks)
- (d) An insurance company takes a keen interest in the age at which a person is insured. Consequently a survey conducted on prospective clients indicated that for clients having the same age the probability that they will be alive in 30 years' time is $\frac{2}{3}$. This probability was established using the actuarial tables. If a sample of 5 people was insured now, find the probability of having the following possible outcomes in 30 years
 - All are alive (1mk)
 - At least 3 are alive (2mks)
 - At most one is alive (2mks)
 - None is alive (1mk)
 - At least 1 is alive (1mk)

QUESTION FIVE (20 MARKS)

- (a) Two different types of drugs A and B were tried on certain patients for increasing weights, 5 persons were given drug A and 7 persons were given drug B. the increase in weight (in pounds) is given below

Drug A	8	12	16	9	3		
Drug B	10	8	12	15	6	8	11

Do the two drugs differ significantly with regard to their effect in increasing weight?
(Given that $v = 10$; $t_{0.05} = 2.23$) (10mks)

- (b) A random sample of 400 persons was selected from each of three age groups and each person was asked to specify which types of TV programs be preferred. The results are shown in the following table

Age group	Type of program			Total
	A	B	C	
Under 30	120	30	50	200
30 – 44	10	75	15	100
45 and above	10	30	60	100
Total	140	135	125	400

Test the hypothesis that the populations are homogenous with respect to the types of television program they prefer, at 5% level of significance. (10mks)

QUESTION SIX (20 MARKS)

- (a) A sample of 600 accounts was taken to test the accuracy of posting and balancing of accounts where in 45 mistakes were found. Find out the population proportion. Use 99% level of confidence. (8mks)
- (b) An agronomist was interested in the particular fertilizer yield output. He planted maize on 50 equal pieces of land and the mean harvest obtained later was 60 bags per plot with a standard deviation of 1.5 bags. The crops grew under natural circumstances and conditions without the soil being treated with any fertilizer. The same agronomist carried out an alternative experiment where he picked 60 plots in the same area and planted the same plant of maize but a fertilizer was applied on these plots. After the harvest it was established that the mean harvest was 63 bags per plot with a standard deviation of 1.3 bags. Required: Conduct a statistical test in order to establish whether there was a significant difference between the mean harvests under the two types of field conditions. Use 5% level of significance. (12mks)