JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF BUSINESS & ECONOMICS

UNIVERSITY EXAMINATION FOR THE DEGREE OF MASTER OF BUSINESS ADMINISTRATION

1ST YEAR 1ST SEMESTER 2024/2025 ACADEMIC YEAR

MAIN CAMPUS/KISUMU CAMPUS

COURSE CODE: MBA 805

COURSE TITLE: Quantitative Methods

EXAM VENUE: **STREAM: (MBA)**

DATE: **EXAM SESSION:**

TIME: 3 HOURS

Instructions:

1. **Answer ANY FOUR questions**
2. **Candidates are advised not to write on the question paper.**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

QUESTION ONE (15MARKS)

a. Given the matrix $A = \begin{bmatrix} 6 & 2 & 3 \\ 4 & 0 & 5 \\ 1 & 3 & 7 \end{bmatrix}$

Required:

i. $A + 2A^T$ **(2 marks)**

ii. $|A|$ **(2 marks)**

b. The manufacturer of Pepsi Soft drinks has been facing stiff competition on its main brand Pepsi soda within the Wester region market. The management of Pepsi Company is considering an extensive advertising campaign for Pepsi soda. Currently before adverstising the transition matrix of consumer between Pepsi and other brands is given as:

		TO	
		Pepsi	Other brands
FROM	Pepsi	0.7	0.3
	Other brands	0.4	0.6

After advertising, the transition probability matrix concerning the behaviour of customers was given as:

		TO	
		Pepsi	Other brands
FROM	Pepsi	0.9	0.1
	Other brands	0.7	0.3

The advertising campaign is expected to cost Shs1.5 million each week. There are 560,000 consumers of soft drinks in the western region market and for each consumer the average profitability is Shs10 weekly.

Required:

i. The equilibrium state proportion of consumers using Pepsi before the advertising campaign. **(5 marks)**

ii. The equilibrium state proportion of consumers using after after the advertising campaign. **(4 marks)**

iii. The expected weekly profit or loss after the advertising campaign. Would you recommend the advertising campaign? **(3 marks)**

QUESTION TWO (15 MARKS)

a. The demand function Q = f (P) for a product is quadratic in the form

$$\mathbf{Q = xP^2 + yP + z}.$$

Where Q = quantity demanded and P=price per unit.

Three points (P, Q) which lie on the function are (5, 1600), (10, 900) and (20,100).

Required;

i. Find the values of x, y and z hence write the demand function **(5marks)**

ii. determine the quantity demanded when the price is Kshs50 **(1mark)**

b. (i.) Solve for x by completing square method: $12x^2 - 15x = 18$ **(4 marks)**

(ii). A manufacturer makes men and women shoes. Each men shoe requires one strip of leather and 2 hours of labour. Each women shoe requires 2 strips of leather and 3 hours of labour. 80 leather strips and130 hours of labour are available and all must be used. Formulate a system of linear equations hence determine the number of shoes of either kind that can be made. **(5 mark)**

QUESTION THREE (15 MARKS)

a. With relevant examples, clearly distinguish between mutually exclusive events and independent events **(2 marks)**

b. A salesman has 80% chance of making a sale to each customer. The behavior of each customer is independent. If two customers A and B enter, what is the probability that the salesman will

i. Make a sale to A or B **(1mark)**

ii. Make no sale **(1mark)**

c. At Kisii Naivas supermarket, 40% of the customers pay by credit cards and the payment follow a binomial distribution. Find the probability that in a rondomly selected sample of 10 customers,

i. Exactly 2 pay by credit card **(2 marks)**

ii. None pay by credit card **(2marks)**

d. The average monthly sales of 5,000 firms are normally distributed with mean Kshs36,000 and standard deviation Kshs10,000.

Required :

i. The number of firms with sales of over Kshs40,000. **(2 marks)**

ii. The percentage of firms with sales between Kshs38,500 and Kshs41,000. (**2 marks)**

iii. The number of firms with sales between Kshs30,000 and Kshs40,000.
(3 marks)

QUESTION FOUR (15 MARKS)

A bakery bakes cakes under the brand name 'super cakes'. Irene, the manageress does not know the cost of each cake. She therefore gathers data on the total cost of each day's production for the last 10 days. The results are shown in the table below;

Day	**Number of cakes ('000' units)**	**Total cost (Kshs'000')**
1	24	236
2	20	210
3	28	262
4	22	223
5	30	275
6	20	210
7	24	236
8	26	249
9	18	197
10	18	197

(i)Estimate the total cost function in the for y = a + bx using ordinary least squares method and identify the fixed cost and unit cost **(8 marks)**

i. If the bakery management projects a production level of 200 units on a particular day due to demand for weddings, how many would the bakery incur in terms of costs? **(2Marks)**

ii. Calculate the Correlation Coefficient and comment on the strength of the relationship between the number of cakes sold and the total cost. **(5marks)**

QUESTION FIVE (15MARKS)

a. Find the derivative of the following functions

i. $y = (10x^3 + 8x - 5)(3x + 2)$ using the product rule **(2marks)**

ii. $y = \frac{3x^3 - x^2}{x^2 + 10}$ using the quotient rule **(3marks)**

$y = (2x^3 - 6x + 11)^5$ using the Chain rule **(2marks)**

b. The average revenue function of a firm is determined to be;

AR=200-8Q

Where AR is average revenue in millions of shillings and Q is the output in units.

Investigation of the firm's cost profile shows that marginal cost (MC) is given by:

$MC=Q^2 - 28Q+211$(million shillings)

Further investigations have shown that the firm's cost when not producing output is sh.10 million.

Required:

i. The total cost function **(2marks)**
ii. The level of output that maximizes profit **(4marks)**
iii. The marginal revenue at the profit maximizing output. **(2marks)**

QUESTION SIX (15MARKS)

(a)Using relevant examples, explain the following concepts as used in set theory:

(i) Subset **(1 mark)**
(ii) Disjoint sets **(1 mark)**

(b) Given A={ 1,3,5,7} determine:

(i)Power of A **(3 marks)**
(ii)Cardinality of A **(1 mark)**

(b) Safaricom Kenya Limited carried out a survey amongst 800 students in JOOUST to determine their air time denomination preferences. 200 preferred Bamba Twenty Shillings airtime, 322 preferred Bamba Fifty Shillings airtime and 278 preferred Bamba Hundred Shillings airtime. 80 of them preferred Bamba Twenty Shillings airtime and Bamba Fifty Shillings airtime, 96 preferred Bamba Twenty Shillings airtime and Bamba Hundred Shillings airtime while 168 preferred Bamba Fifty Shillings airtime and Bamba Hundred Shillings airtime. 300 of the students surveyed were Airtel clients and therefore preferred none of the Safaricom air time under survey.

Required:

1. By letting y be the number of students who preferred the three airtime denominations, illustrate the information in a Venn-diagram **(4 marks)**
2. Find how many students preferred:
   (i) all the three airtime denominations **(3marks)**
   (ii) Bamba Fifty Shillings airtime only **(1mark)**
   (iii) Bamba Hundred Shillings airtime and Bamba Fifty Shillings airtime only **(1 mark**

AREA UNDER STARDARD NORMAL CURVE

Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0910	.0948	.0987	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1519	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4646	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4553	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.499	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990