



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF BUSINESS & ECONOMICS
UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF LOGISTICS
AND SUPPLY CHAIN MANAGEMENT
3RD YEAR 1ST SEMESTER 2022/2023 ACADEMIC YEAR

MAIN CAMPUS

COURSE CODE: BAB 9301

COURSE TITLE: BUSINESS STATISTICS II

EXAM VENUE: STREAM: (BLSCM)

DATE: 09/12/2022 EXAM SESSION: 9.00-11.00AM

TIME: 2 HOURS

INSTRUCTIONS

- 1. Answer Question ONE (COMPULSORY) and ANY other 2 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 (30 MARKS)- COMPULSORY

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

- Required: Compute a Spearman rank-order correlation on the data and give interpretation **(5 marks)**

- b. State and explain any two probability and two non-probability sampling methods **(4 marks)**

- c. (i) If $Z = \frac{X - \mu}{\sigma}$, show that Z is normally distributed with mean zero and standard deviation one. **(4 marks)**

(ii) A manufacturer assures his customers that the probability of having defective item is 0.005. A sample of 1000 items was inspected. If we let X be a random variable that a defective item is inspected, then X is found to have a poisson distribution. Find the probabilities of having the following possible outcomes:

1. Only one is defective **(2 marks)**

2. At most two are defective **(4 marks)**

- (ii) The table below shows the number of new tax payers registering with Kenya Revenue Authority on a weekly basis.

No. of new tax payers per week(x)	0	1	2	3	4	Total
Total Probability (p)	0.20	0.36	0.30	0.12	0.02	1.0

Required: Determine expected number of tax payers registering weekly. **(2 marks)**

- d. Differentiate between Type I and type II errors as used in test of hypothesis: **(2 marks)**

- e. The data below represents company sales. Calculate 3 monthly moving averages, for the data

Period	1	2	3	4	5
Sales(US \$)	12000	12800	13100	12700	11900

(3 marks)

f. Analysis done by the department of management science shows that a student's core (Y) depends on the number of hours studied (X_1), the student's IQ (X_2) and the number of assignments done (X_3). The general form is $Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3$

Calculations have produced the following values ; $Y = \$86 + 0.37X_1 + 0.08X_2 + 0.55X_3$

$$r_{x_1}^2 = 0.78, \quad r_{x_2}^2 = 0.16, \quad r_{x_3}^2 = 0.20 \quad \text{and} \quad R^2 = 0.88$$

Required: Interpret these values.

(4 marks)

QUESTION TWO (20 MARKS)

- a) What is a binomial probability distribution? **(2 mark)**
- b) 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 was 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:
- i) Only one person had the disease **(3 marks)**
 - ii) Exactly two people had the disease **(3 marks)**
 - iii) At most two people had the disease **(5 marks)**
 - iv) At least two people had the disease **(5 marks)**
- c) State the four components of a time series **(2 marks)**

QUESTION THREE (20 MARKS)

- a. The following data relates to the sales revenue for five trading periods for Naivas Supermarket.

Period	1	2	3	4	5
Sales(\$ million)	50	200	450	800	1,250

It is established that the relationship between sales and trading period is non-linear (ie logarithmic function).

Required:

- (i) By taking x as the periods and y as the sales, linearise the exponential relationship and hence determine the non-linear regression equation in the form $y = ax^b$ **(9 marks)**

(ii) Estimate the sales during the 6th trading period.

(1 mark)

b.

A random sample of 400 residents of counties was selected from each of three counties and each resident was asked to specify which types of project is preferred. The results are shown in the following table.

County	Type of Program			Total
	Fishery	Dairy	Chicken	
Kisumu	120	30	50	200
Kakamega	10	75	15	100
Busia	10	30	60	100
Total	140	135	125	400

Test the hypothesis that the populations are homogenous with respect to the types of Project they prefer, at 5% level of significance.

(10 marks)

QUESTION FOUR (20 MARKS)

a. (i) Every decision problem has four basic features. State and explain three of such features.

(3 marks)

(ii) The management of Majani Company is considering setting the price for its products. A payoff matrix (in Kshs) is worked out for the various states of nature and decision actions are tabulated as shown below:

State of Nature	Probability	PRICE ALTERNATIVES		
		Kshs40	Kshs45	Kshs50
High demand	0.2	6,320	6,600	6,800
Medium demand	0.5	5,040	5,050	5,060
Low demand	0.3	2,800	2,970	3,060

By using the following decision criterion, advice the management on which price to adopt

- (i) The Maxi Min criterion **(3 marks)**
 - (ii) The Maxi Max criterion **(3 marks)**
 - (iii) The expected monetary value (EMV) criterion **(4 marks)**
- b. Unique Furniture Company estimates that it will sell 36,000 units of its product for the forthcoming year. The ordering cost is Kshs200 per order and the carrying cost per unit per year is 20% of the purchase price per unit. The purchase price per unit is Kshs50. Find;
- i. Economic order quantity **(4 Marks)**
 - ii. The number of orders per year **(3 Marks)**

QUESTION FIVE (20MARKS)

- (a) A car assembly based in Kenya sells cars using sales agents. The management is interested in investigating the effect of additional sales agents on its sales. The following data for the past six years is available.

Year	Number of sales Agents	X	Number of Cars sold Y
2016	10	10	150
2017	10	10	170
2018	20	20	230
2019	20	20	200
2020	30	30	220
2021	30	30	260

Required:

- (i) By taking number of sales agents (X) as the independent variable and Number of cars (Y) as the dependent variable obtain the simple linear regression equation in the form $Y = a + bX$ **(9 marks)**
- (ii) The company management projects to make 1025 sales in the year 2022. How many sales agents should be hired to achieve this target? **(1 mark)**

(iii) Calculate the correlation coefficient and comment on the nature and strength of the relationship between sales persons and number of policies sold **(3 marks)**

(iv) Hence, determine the coefficient of determination and give interpretation of your result **(2 marks)**

(b) (i) State Bayes theorem **(1 mark)**

(ii) Analysis of questionnaire completed by holiday makers showed that 0.75 classified their holiday as good at Malindi. The probability of hot weather in the resort is 0.6. If the probability of regarding holiday as good given hot weather is 0.9, what is the probability that there was hot weather if a holiday maker considers his holiday good? **(4 marks)**

χ^2 (Chi-Squared) Distribution: Critical Values of χ^2

Degrees of freedom	Significance level		
	5%	1%	0.1%
1	3.841	6.635	10.828
2	5.991	9.210	13.816
3	7.815	11.345	16.266
4	9.488	13.277	18.467
5	11.070	15.086	20.515
6	12.592	16.812	22.458
7	14.067	18.475	24.322
8	15.507	20.090	26.124
9	16.919	21.666	27.877
10	18.307	23.209	29.588

STANDARD NORMAL DISTRIBUTION TABLE

Entries represent $\Pr(Z \leq z)$. The value of z to the first decimal is given in the left column. The second decimal is given in the top row.

Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000		0.5040		0.5080		0.5120		0.5160	0.5199
		0.5239		0.5279		0.5319		0.5359		
0.1	0.5398		0.5438		0.5478		0.5517		0.5557	0.5596
		0.5636		0.5675		0.5714		0.5753		
0.2	0.5793		0.5832		0.5871		0.5910		0.5948	0.5987
		0.6026		0.6064		0.6103		0.6141		
0.3	0.6179		0.6217		0.6255		0.6293		0.6331	0.6368
		0.6406		0.6443		0.6480		0.6517		
0.4	0.6554		0.6591		0.6628		0.6664		0.6700	0.6736
		0.6772		0.6808		0.6844		0.6879		
0.5	0.6915		0.6950		0.6985		0.7019		0.7054	0.7088
		0.7123		0.7157		0.7190		0.7224		
0.6	0.7257		0.7291		0.7324		0.7357		0.7389	0.7422
		0.7454		0.7486		0.7517		0.7549		
0.7	0.7580		0.7611		0.7642		0.7673		0.7704	0.7734
		0.7764		0.7794		0.7823		0.7852		
0.8	0.7881		0.7910		0.7939		0.7967		0.7995	0.8023
		0.8051		0.8078		0.8106		0.8133		
0.9	0.8159		0.8186		0.8212		0.8238		0.8264	0.8289
		0.8315		0.8340		0.8365		0.8389		
1.0	0.8413		0.8438		0.8461		0.8485		0.8508	0.8531
		0.8554		0.8577		0.8599		0.8621		
1.1	0.8643		0.8665		0.8686		0.8708		0.8729	0.8749
		0.8770		0.8790		0.8810		0.8830		
1.2	0.8849		0.8869		0.8888		0.8907		0.8925	0.8944
		0.8962		0.8980		0.8997		0.9015		
1.3	0.9032		0.9049		0.9066		0.9082		0.9099	0.9115
		0.9131		0.9147		0.9162		0.9177		
1.4	0.9192		0.9207		0.9222		0.9236		0.9251	0.9265
		0.9279		0.9292		0.9306		0.9319		
1.5	0.9332		0.9345		0.9357		0.9370		0.9382	0.9394
		0.9406		0.9418		0.9429		0.9441		
1.6	0.9452		0.9463		0.9474		0.9484		0.9495	0.9505
		0.9515		0.9525		0.9535		0.9545		
1.7	0.9554		0.9564		0.9573		0.9582		0.9591	0.9599
		0.9608		0.9616		0.9625		0.9633		

1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678
		0.9686	0.9693	0.9699	0.9706	
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744
		0.9750	0.9756	0.9761	0.9767	
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798
		0.9803	0.9808	0.9812	0.9817	
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842
		0.9846	0.9850	0.9854	0.9857	
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878
		0.9881	0.9884	0.9887	0.9890	
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906
		0.9909	0.9911	0.9913	0.9916	
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929
		0.9931	0.9932	0.9934	0.9936	
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946
		0.9948	0.9949	0.9951	0.9952	
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960
		0.9961	0.9962	0.9963	0.9964	
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970
		0.9971	0.9972	0.9973	0.9974	
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978
		0.9979	0.9979	0.9980	0.9981	
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984
		0.9985	0.9985	0.9986	0.9986	
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989
		0.9989	0.9989	0.9990	0.9990	
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992
		0.9992	0.9992	0.9993	0.9993	
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994
		0.9994	0.9995	0.9995	0.9995	
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996
		0.9996	0.9996	0.9996	0.9997	
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997
		0.9997	0.9997	0.9997	0.9998	
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
		0.9998	0.9998	0.9998	0.9998	
3.6	0.9998	0.9998	0.9999	0.9999	0.9999	0.9999
		0.9999	0.9999	0.9999	0.9999	
3.7	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
		0.9999	0.9999	0.9999	0.9999	

3.8	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
		0.9999	0.9999	0.9999	0.9999		
3.9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
		1.0000	1.0000	1.0000	1.0000		

Values of z for selected values of $\Pr(Z \leq z)$

Z	0.842	1.036	1.282	1.645	1.960	2.326	2.576
$\Pr(Z \leq z)$	0.800	0.850	0.900	0.950	0.975	0.990	0.995