**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**

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**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**

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**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 probabilityand two non-probability sampling methods **(4 marks)**

c. (i) If = $\frac{X-\mu}{\sigma}$, 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 students's core (Y) depents on the number of hours studied ($X_1$), the students's IQ ($X_2$) and the number of assignments done ( X3). The general form is $Y= a + b_1 X_1 + b_2 X_2 + b_3 X_3$

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

$\mathbf{r^2_{x1} = 0.78}$ **,** $\mathbf{r^2_{x2} = 0.16}$**,** $\mathbf{r^2_{x3} = 0.20}$ **and** $\mathbf{R^2 = 0.88}$

**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 expenetial relationship and hence determine the non-linear regresion equation in the form $\mathbf{y}= a\mathbf{x}^b$ **(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.

| | **Type of Program** | | | |
|---|---|---|---|---|
| **County** | Fishery | Dairy | Chicken | **Total** |
| 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 | 150 |
| 2017 | 10 | 170 |
| 2018 | 20 | 230 |
| 2019 | 20 | 200 |
| 2020 | 30 | 220 |
| 2021 | 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

**Significance level**

| **Degrees of freedom** | **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 ≤ 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 | | |
| 3.9 | 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 ≤ z)**

| **Z** | 0.842 | 1.036 | 1.282 | 1.645 | 1.960 | 2.326 | 2.576 |
|---|---|---|---|---|---|---|---|
| **Pr(Z ≤ z)** | 0.800 | 0.850 | 0.900 | 0.950 | 0.975 | 0.990 | 0.995 |