

FINAL EXAMINATION

Semester	:	MAY 2024 SEMESTER
Programme Name	:	DIPLOMA IN BUSINESS STUDIES DIPLOMA OF ACCOUNTANCY
Course Code & Name	:	DBMT3033 QUANTITATIVE METHODS
Duration	:	3 HOURS

INSTRUCTIONS TO CANDIDATES:

1. Please read the instructions given in the question paper **CAREFULLY**.
2. The question paper consists of **FOUR (4)** questions.
3. Answer **ALL** questions in the question paper.
4. Answers to the questions are to be written into the examination booklet.
5. Electronic dictionaries, lecture notes, files or any unauthorised materials except writing equipment are strictly prohibited.

This question paper must be submitted along with all used and/or unused rough papers and/ or graph papers (if any). Candidates are **NOT ALLOWED** to take any examination paper(s) used or unused out of the examination hall.

WARNING:

The Examination Board of Peninsula College Georgetown regards cheating as a very serious offence and will not hesitate to mete out the appropriate punitive actions according to the severity of the offence committed, and in accordance with the clauses stipulated in the Students' Handbook, up to and including expulsion from Peninsula College Georgetown.

(This booklet contains 5 printed pages including this page)

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE ALLOWED TO DO SO

Answer **ALL** questions on the separate sheet provided.

[100 marks]

1. The following table shows a study on the number of hours studied and the final exam scores of seven randomly selected students from a mathematics class.

Hours Studied (x)	4	7	1	6	3	8	5	2
Final Exam Score % (y)	78	85	60	88	70	95	80	65

- a) Plot a scatter diagram using the data provided and describe the relationship between the two variables. (7 marks)
- b) Create a table to show calculation of x^2 , y^2 and xy . (12 marks)
- c) Using the values calculated in Q1(b), determine the Pearson product-moment correlation coefficient. (6 marks)

Total: [25 marks]

2. The following table presents a study on the temperature deviation from the average and the change in energy consumption for a residential area.

Temperature Deviation (x)	-5	-2	0	3	4	7
Change in Energy Consumption (y)	15	9	7	6	4	1

$$\text{Given } \sum_{i=1}^n x_i = 7; \quad \sum_{i=1}^n y_i = 42; \quad \sum_{i=1}^n x_i^2 = 103; \quad \sum_{i=1}^n x_i y_i = -52$$

- a) Determine the regression equation $y' = a + bx$ for the given information. (9 marks)
- b) Using the regression equation obtained in Q2a, find y' when $x = 2$ and $x = 6$. (4 marks)
- c) Use the regression equation in Q2b to determine the predicted values of y' . (6 marks)
- d) Use the predicted and actual values of y in Q2c to calculate the residuals. (6 marks)

Total: [25 marks]

3. a) For the following time series, compute the three-period moving averages. (5 marks)

Period	1	2	3	4	5	6	7	8	9	10	11	12
Time Series	48	41	37	32	36	31	43	52	60	48	41	30

3. b) Apply exponential smoothing with $w = 0.1$ to the following time series data to detect the components of the series. Show the calculations and the final smoothed values. (12 marks)

Period	1	2	3	4	5	6	7
Time Series	12	18	16	24	17	16	25

- c) Briefly explain the benefits of using a control chart. (8 marks)
- Total: [25 marks]

4. In a recent study on consumer preferences across different age groups, researchers surveyed 500 individuals and asked them to choose their preferred type of vacation: beach, adventure, or cultural. The survey results are summarized below:

Vacation Type	Observed frequency
Beach	170
Adventure	155
Cultural	175

According to previous research, it was hypothesized that 40% of consumers prefer beach vacations, 30% prefer adventure vacations, and the remaining 30% prefer cultural vacations.

Utilizing the data presented in the table above, conduct a formal statistical test to assess whether there is substantial evidence to challenge the hypothesized distribution of vacation preferences.

- a) State the null and alternatives hypotheses that you are testing. (4 marks)
- b) Calculate the expected frequency. (3 marks)
- c) Which categories will provide the largest and the least contribution to the test statistic? (2 marks)
- d) Determine the relevant test statistic by calculating $(O-E)$, $(O-E)^2$ and $(O-E)^2/E$. (10 marks)
- e) State the critical value and the degrees of freedom used for the test with $\alpha=0.05$. (2 marks)
- f) Make a conclusion based on the result obtained in Q4e. (4 marks)
- Total: [25 marks]

- END OF QUESTIONS -

APPENDIX A: FORMULAE SHEET

CORRELATION

$$r = \frac{n \sum xy - (\sum x)(\sum y)}{\sqrt{n(\sum x^2) - (\sum x)^2} \sqrt{n(\sum y^2) - (\sum y)^2}}$$

REGRESSION

$$a = \frac{\sum Y}{n} - b \frac{\sum X}{n} :$$

$$b = \frac{n(\sum XY) - (\sum X)(\sum Y)}{n(\sum X^2) - (\sum X)^2} :$$

$$SST = \sum_{i=1}^n (y_i - \bar{y})^2$$

TIME SERIES

$$\begin{aligned} F_{t+1} &= \text{average of } n \text{ most recent observations} \\ &= \frac{\text{latest demand} + \text{next latest} + \dots + n\text{th latest}}{n} \\ &= \frac{y_t + y_{t-1} + \dots + y_{t-n+1}}{n} \end{aligned}$$

$$b = \frac{\sum tY - (\sum Y)\left(\frac{\sum t}{n}\right)}{\sum t^2 - \frac{(\sum t)^2}{n}}$$

$$a = \frac{\sum Y}{n} - b \left(\frac{\sum t}{n} \right)$$

$$S_t = \omega y_t + (1 - \omega)S_{t-1}$$

The test statistic formula for the chi-squared goodness-of-fit test is given by:

$$\chi^2 = \sum \frac{(O-E)^2}{E}$$

APPENDIX B: CHI-SQUARE TABLE

Critical values of the Chi-square distribution with d degrees of freedom							
Probability of exceeding the critical value							
d	0.05	0.01	0.001	d	0.05	0.01	0.001
1	3.841	6.635	10.828	11	19.675	24.725	31.264
2	5.991	9.210	13.816	12	21.026	26.217	32.910
3	7.815	11.345	16.266	13	22.362	27.688	34.528
4	9.488	13.277	18.467	14	23.685	29.141	36.123
5	11.070	15.086	20.515	15	24.996	30.578	37.697
6	12.592	16.812	22.458	16	26.296	32.000	39.252
7	14.067	18.475	24.322	17	27.587	33.409	40.790
8	15.507	20.090	26.125	18	28.869	34.805	42.312
9	16.919	21.666	27.877	19	30.144	36.191	43.820
10	18.307	23.209	29.588	20	31.410	37.566	45.315