



FINAL EXAMINATION

Programme Name	:	DIPLOMA IN COMPUTER SCIENCE
Course Code & Name	:	DCS1123 DISCRETE MATHEMATICS
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 the accordance with the clauses stipulated in the Students' Handbook, up to and including expulsion from Peninsula College Georgetown.

(This booklet contains 4 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. a) Draw a logic circuit using AND, OR and NOT gates corresponding to the Boolean Expression, $A = XY + (X + \bar{Y})(Z + Y)$ (6 marks)

- b) Let $P = \{a, b, c\}$ and $Q = \{0,1\}$.
 - i) Find the Cartesian Product, $P \times Q$. (3 marks)
 - ii) List the Power Sets for Q . (3 marks)

- c) A bucket of water with volume of 2850ml is poured into 15 different cups such that the volume of each cup follow the arithmetic progression. The largest cup of water is 330 ml.
 - i) Calculate the volume of the first cup of water. (4 marks)
 - ii) Find the difference between the two consecutive cups. (4 marks)
 - iii) If the cups are continue to be filled in the same sequence, determine the n^{th} cup where the volume of the cup is exceeding 500ml. (5 marks)

Total: [25 marks]

2. a) A bag contains 15 marbles, including 6 red and 7 blue. A marble is drawn at random. Find the following probabilities.
 - i) The drawn marble is blue. (2 marks)
 - ii) The drawn marble is not red. (2 marks)
 - iii) The drawn marble is blue or red. (3 marks)

- b) Suppose a coin is tossed 2 times in a row,
 - i) Draw the tree diagram to illustrate all the possible events. (6 marks)
 - ii) What is the probability of getting 1 head and 1 tail? (2 marks)

- c) There are 24 students taking Subject A, while there are 30 students taking subject B. It is known that there are total of 38 students.
 - i) What is the probability to randomly choose a student who is taking both subject? (4 marks)
 - ii) Draw a Venn Diagram to illustrate the probability of students taking both subjects. (3 marks)
 - iii) What is the probability of a student in Subject A class also taking Subject B? (3 marks)

Total: [25 marks]

3. a) How many numbers between 10,000 and 60,000 can be formed with the digits 1, 2, 3, 4, 5, 6, and 7 such that no digits are repeated in any of the numbers formed. (5 marks)
- b) How many unique ID with 6 characters can be formed by using vowels and the digits 0, 1, 2, 3, and 4, if the characters cannot be repeated and
- i) Must have 2 vowels at the front of the ID. (5 marks)
- ii) No restriction on the position and number of vowels and numbers. (5 marks)
- c) A football team manager needs to select 11 players from all his players. Given that he needs to ensure his selection consists of 3 defenders, 4 midfielders, 3 forwards and 1 goalkeeper. Currently his team has a total of 3 goalkeepers, 7 defenders, 9 midfielders and 5 forwards.
- i) How many possible teams he can pick? (5 marks)
- ii) If he needs to pick another 5 players from any position to be his substitute team. How many possible teams he can pick? (5 marks)
- Total: [25 marks]

4. a) Given the graph in Figure 4a below,

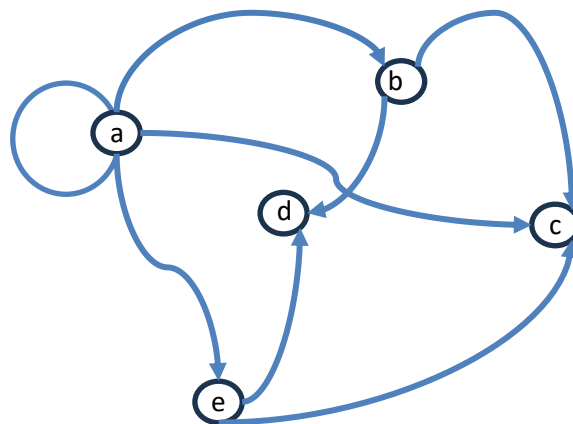


Figure 4a

- i) identify the $\deg^-$ and $\deg^+$ of each vertex. (5 marks)
- ii) proof that $|E| = \sum \deg^-(v) = \sum \deg^+(v)$. (3 marks)

b) Given that the graph in Figure 4b below,

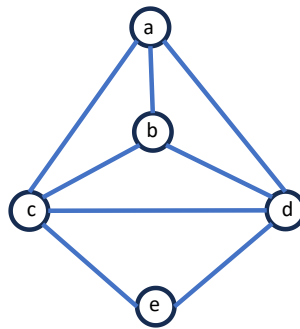


Figure 4b

- i) What is the condition for a graph to have a Euler Circuit or Path? (4 marks)
 - ii) Does the graph in **Figure 4b** have a Euler Circuit or Path? (3 marks)
 - iii) What is Dirac's theorem and Ore's theorem said about Hamilton Path and Circuit? (6 marks)
 - iv) Does the graph in **Figure 4b** have a Hamilton Path or Circuit? (4 marks)
- Total: [25 marks]

- END OF QUESTIONS -