

Pearson **Higher Nationals in** **Computing**

Unit: 18 Discrete Maths

For use with the Higher National Certificate and
Higher National Diploma in Computing

Brief Number: 1

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Issue 1



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Higher National Certificate/Diploma in Computing

Student Name/ID Number	
Unit Number and Title	18: Discrete Maths
Academic Year	
Unit Tutor	
Assignment Title	
Issue Date	
Submission Date	
IV Name & Date	

Submission Format

This assignment should be submitted at the end of your lesson, on the week stated at the front of this brief. The assignment can either be word-processed or completed in legible handwriting.

If the tasks are completed over multiple pages, ensure that your name and student number are present on each sheet of paper.

Unit Learning Outcomes

LO1. Examine set theory and functions applicable to software engineering.

LO2. Analyse mathematical structures of objects using graph theory.

LO3. Investigate solutions to problem situations using the application of Boolean algebra.

Part 1

- a. Prove the following Boolean equations using laws of Boolean algebra.

$$(\bar{a}.\bar{b} + c)(a + b)(\overline{\bar{b} + ac}) = cb(a + b)(\bar{a} + \bar{c})$$

$$(\overline{AB + \bar{A} + AB}) = 0$$

- b. Draw a Logic Circuit for the Boolean Expression given bellow

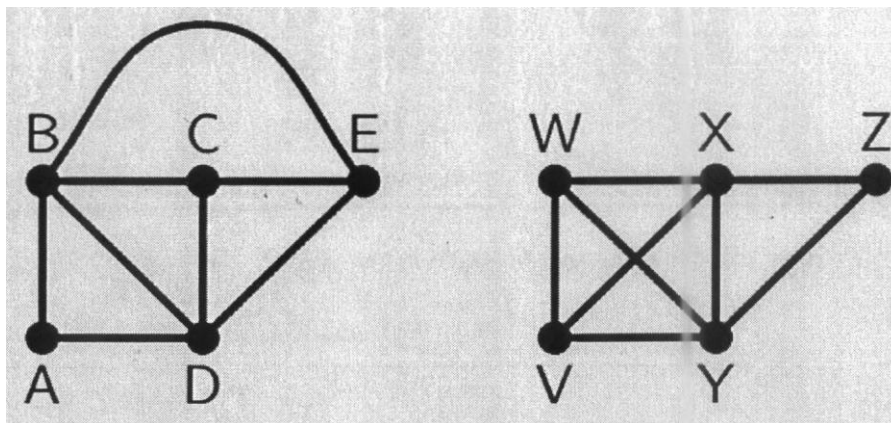
$$Y = \bar{A}C + \bar{B}C + ABC$$

- c. Show that the following function is one-to-one.

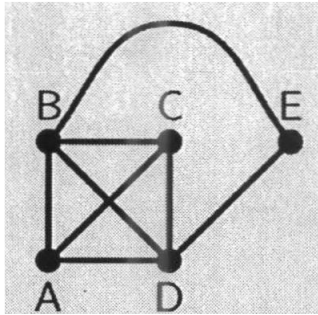
$$f: R - \{-4\} \rightarrow R \qquad f(x) = \frac{(x-3)}{(x+4)}$$

Part 2

- a. Determine whether the following graphs are isomorphic. If they are not give an isomorphic invariant that they do not share.



- b. Determine whether the given graph has an Euler circuit. Construct such a circuit if it exists. If no Euler circuit exists, determine whether the graph has an Euler path and construct such path if one exists



- c. Draw a graph with the degree sequence 6,5,4,3,2,1,1. If a graph cannot be drawn give reasons. If it can be drawn, state the reasons.

LO4. Explore applicable concepts within abstract algebra.

Part 3

An outbreak of Dengue fever hit the local public schools. In one particular school there are 100 male juniors, 80 male seniors, 120 female juniors, and 100 female seniors. Approximately 15% of the male and female juniors and 25% of the male and female seniors are currently healthy, 35% of the male and female juniors and 30% of the male and female seniors are currently sick, and 50% of the male and female juniors and 45% of the male and female seniors are carriers of Dengue fever.

- I. Represent number of juniors and seniors with respect to their gender in a 2×2 matrix
- II. Represent the number of juniors and seniors in a 2×3 matrix in terms of the category, they belongs such as healthy, sick and carriers.
- III. By using matrix multiplication, find out how many males and how many females are healthy, sick, and carriers.

Part 4

The admission fee at a small fair is \$1.50 for children and \$4.00 for adults. On a certain day, 2200 people enter the fair and \$5050 is collected.

- I. Write down 2 equations to find how many children and how many adults attended the fair.
- II. Write the above 2 equations in matrix form, $AX=b$.
- III. Find the inverse of the coefficient matrix A .
- IV. Find how many children and how many adults attended the fair using the inverse matrix.

Learning Outcomes and Assessment Criteria

Pass		Merit	Distinction
LO1 Examine set theory and functions applicable to software engineering			D1 Formulate corresponding proof principles to prove properties about defined sets.
P1 Perform algebraic set operations in a formulated mathematical problem.	P2 Determine the cardinality of a given bag (multiset).	M1 Determine the inverse of a function using appropriate mathematical techniques.	
LO2 Analyse mathematical structures of objects using graph theory			D2 Construct a proof of the Five Colour Theorem.
P3 Model contextualised problems using trees, both quantitatively and qualitatively.	P4 Use Dijkstra's algorithm to find a shortest path spanning tree in a graph.	M2 Assess whether an Eulerian and Hamiltonian circuit exists in an undirected graph.	
LO3 Investigate solutions to problem situations using the application of Boolean algebra			D3 Design a complex system using logic gates.
P5 Diagram a binary problem in the application of Boolean Algebra.	P6 Produce a truth table and its corresponding Boolean equation from an applicable scenario.	M3 Simplify a Boolean equation using algebraic methods.	

Pass	Merit	Distinction
LO4 Explore applicable concepts within abstract algebra		D4 Prepare a presentation that explains an application of group theory relevant to your course of study.
<p>P7 Describe the distinguishing characteristics of different binary operations that are performed on the same set.</p> <p>P8 Determine the order of a group and the order of a subgroup in given examples.</p>	M4 Validate whether a given set with a binary operation is indeed a group.	