-SQA-SCOTTISH QUALIFICATIONS AUTHORITY

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NATIONAL CERTIFICATE MODULE DESCRIPTOR

-Module Number-   **0091060**   **-Session-1988-89**

-Superclass-   **RB**

-Title-   **MATHEMATICS: ANALYSIS/ALGEBRA 3**

-DESCRIPTION-

Purpose

This module is designed to extend the concepts of polynomials and circles and introduces matrix algebra and complex numbers. It can be used within a wide range of vocational programmes such as Engineering.

Refer to the Appendix for guidance on the framework of the mathematics modules.

Preferred Entry Level

81059 Mathematics: Analysis/Algebra 2 and
81062 Mathematics: Calculus 1 (A) or equivalent.

Learning Outcomes

The student should:

1.   use matrix algebra;

2.   use complex numbers in the cartesian form;

3.   use polynomial relationships;

4.   use the properties of circles;

5.   apply mathematical knowledge and skills in a problem solving context.

Content/
Context

<u>Corresponding to Learning outcomes 1-5:</u>

1.   Express data in marix form. State the meaning of matrix order, element, row, column with appropriate notation. Identify matrices which are conformable for addition/subtraction and multiplication. Add and subtract conformable matrices. Perform scalar multiplication. Multiply conformable matrices. Defines identity, zero, transpose and diagonal matrices as appropriate. Define non singular matrices and their inverses. Use a computer to find inverses and solve sets of equations. Solve practical problems.

2.   Recognise complex roots from Graphs. Add, subtract, find conjugate, multiply and divide complex numbers in cartesian form. Represent complex numbers on an Argand diagram. Represent complex numbers as vectors. Apply complex numbers to practical problems.

3.   Sketch polynomial functions of degree 3 and above. Use a computer to generate graphs. Determine roots by factors/graphical/ iterative methods. Locate stationary points. Obtain areas. Undertake practical applications.

4.   Obtain the general equation of a circle. Devise from the above the centre and radius. Find the points of intersection of a line and circle. Apply the above in practical applications including computer graphics.

5.   The problems/investigations should involve the application of the content of the other Learning Outcomes.

Suggested
Learning and
Teaching
Approaches

Consolidation of skills should not consist entirely of mechanical exercises but should include problem solving in a practical context where possible. Group investigations are to be encouraged.

Computer access is desirable and software packages should be used where appropriate eg.

Students should maintain a workfile. This should form a complete record of the student's work throughout the module. The tutor should ascertain periodically throughout the module that each student is maintaining the workfile adequately. The workfile should contain (as appropriate) the student's notes, class handouts, completed worksheets, exercises, assignments, reports(s) of investigations(s), log book of computer activities and a summary of the important details of the module for later revision purposes.

Assessment Procedures

Acceptable performance in the module will be satisfactory achievement of all the performance criteria specified for each Learning Outcome.

The following abbreviations are used below:

LO   Learning Outcome
IA   Instrument of Assessment
PC   Performance Criteria

LO1 USE MATRIX ALGEBRA

PC   The student:

(a)   identifies matrices which are conformable for addition/subtraction and multiplication;
(b)   adds and subtracts conformable matrices;
(c)   multiplies conformable matrices;
(d)   determines the inverse of non-singular 2 x 2 matrices;
(e)   uses matrices to solve simultaneous equations involving 2 unknowns.

IA   Calculation Exercise

Topics should be assessed on the number of occasions indicated:

(a)	conformable matrices	4
(b)	addition/subtraction e.g. 2A-2B	4
(c)	multiplication e.g. 2 x 3 by 3 x 2	3
(d)	inverse	3
(e)	systems of equations	3

One questions may cover more than one topic.

Satisfactory achievement of the Learning Outcome will be demonstrated by the student producing 4 correct responses for (a), at least 3 correct responses for (b), and at least 2 correct responses for each of (c), (d), and (e).

LO2 USE COMPLEX NUMBERS IN THE CARTESIAN FORM

PC   The student:

(a)   adds and subtracts complex number in cartesian form;
(b)   multiplies and divides complex numbers in cartesian form;
(c)   represents complex numbers on an Argand Diagram.

IA   Graphical and Calculation Exercise.

Topics should be assessed on the number of occasions indicated:

(a)   addition/subtraction   4
(b)   multiplication/division   4
(c)   Argand Diagram   3

One question may cover more than one topic.

Satisfactory achievement of the Learning Outcome will be demonstrated by the student producing at least 3 correct responses for each of (a) and (b) and at least 2 correct responses for (c).

LO3 USE POLYNOMIAL RELATIONSHIPS

PC   The student:

(a)   determines roots of polynomial functions;
(b)   determines stationary point of polynomial functions.
(c)   sketches polynomial functions showing salient points;

IA   Graphical and Calculation Exercise.

Topics should be assessed on the number of occasions indicated:

(a)   roots from 2 factorisable and 2 non
       4 factorisable polynomials
(b)   stationary points   4
(c)   sketch   3

One question may cover more than one topic.

Satisfactory achievement of the Learning Outcome will be demonstrated by the student producing at least 3 correct responses for each of (a) and (b) and at least 2 correct responses for (c).

LO4 USE THE PROPERTIES OF CIRCLES

PC   The student:

(a)   determines the radius and centre given the general equation of a circle;
(b)   determines the intersection of a straight line and a circle graphically;
(c)   determines the intersection of a straight line and a circle algebraically.

IA   Calculation Exercise.

Topics should be assessed on the number of occasions indicated:

(a)   radius and centre   4
(b)   graphical intersection   1
(c)   algebraic intersection   2

One question may cover more than one topic.

Satisfactory achievement of the Learning Outcome will be demonstrated by the student producing at least 3 correct responses for (a) and at least 1 correct response for each of (b) and (c).

LO5 APPLY MATHEMATICAL KNOWLEDGE AND SKILLS IN A PROBLEM SOLVING CONTEXT

PC   The student:

(a)   interprets a problem;
(b)   selects a strategy to solve the problem;
(c)   obtains a satisfactory solution;
(d)   communicates the solution accurately and logically.

IA   Assignment

4 problems to test the student's ability to draw together the various mathematical ideas and techniques developed in the module. The problems should be expressed in a practical context and each must test the 4 processes in the performance criteria. The 4 problems should take approximately one hour in total to complete.

Satisfactory achievement of the Learning Outcome will be demonstrated by the student completing all 4 processes in the performance criteria for at least 2 of the questions.