## 

# TECHNOLOGICAL UNIVERSITY OF THE SHANNON: MIDLANDS MIDWEST

**SUMMER** **EXAMINATIONS** **2021/2022**

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| MATH06049 - Mathematical Methods |

**MODULE:**

### PROGRAMME(S):

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| LC\_KSFDM\_KMY | Bachelor of Science (Honours) Software Development |
| LC\_KSFDM\_ITH | Higher Certificate in Science Software Development |
| LC\_KNSMM\_KMY | Bachelor of Science (Honours) Computer Networks and Systems Management |
| LC\_KNSMM\_IMY | Higher Certificate in Science Computer Networks and Systems Management |
| LC\_KISYM\_KMY | Bachelor of Science (Honours) Internet Systems Development |
| LC\_KISYM\_JMY | Bachelor of Science Internet Systems Development |
| LC\_KISYM\_IMY | Higher Certificate in Science Internet Systems Development |
| LC\_KIDSM\_KMY | Bachelor of Science (Honours) Immersive Digital Media and Spatial Computing |
| LC\_KIDMM\_KMY | Bachelor of Science (Honours) Interactive Digital Media |
| LC\_KGDVM\_KTH | Bachelor of Science (Honours) Games Design and Development |
| LC\_KGDVM\_ITH | Higher Certificate in Science Computing |
| LC\_KCPTM\_JMY | Bachelor of Science Computing |
| LC\_KCDCM\_KTH | Bachelor of Science (Honours) Computing (Data Analytics and Cyber Security) |
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**YEAR OF STUDY:** 1

**EXAMINER(S):**

|  |  |
| --- | --- |
| Mike O Connell | (Internal) |
|  |  |
|  |  |

**TIME ALLOWED:** TWO (2) HOURS

**INSTRUCTIONS: Answer 4 out of 5 questions.**

**All questions carry equal marks.**

**Instructions are different for Summer 2023…see Moodle.**

**Q1.** (a) Given the following matrices

A = B = C = D =

Find (i) 3B – 2D **(3 marks)**

(iii) BT  **(2 marks)**

(b) Given A = and B =

Show that |AB| = |A|.|B| **(10 marks)**

(c) Given X = find |X|, the determinant of X **(10 marks)**

**(Total 25 Marks)**

**Q2.** (a) Given f(x) = 3x – 5 g(x) = h(x) = x2 + 4

evaluate (i) g(-8) **(2 marks)**

(ii) f(h(x)) **(3 marks)**

(iii) f-1(7) **(2 marks)**

(iv) the value for x for which f(x) = g(x) **(3 marks)**

(b) Given the following trigonometry functions:

y1 = 4sin2x and y2 = 2sinx

(i) State the amplitude and period of the trigonometric functions.

**(4 marks)**

(ii)Sketch, on the same axes, a graph for each of the above functions for 0 ≤ x ≤ 360° clearly labelling your axes.

**(8 marks)**

(iii) Use (i) and (ii) to evaluate 4sin2x when x = 520°. **(3 marks)**

**(Total 25 Marks)**

**Q3.** (a)Given the following sets:

U = {1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20}

A = {2,4,6,8,10,12,14}

B = {10,11,12,13,14,15,16}

C = {10,12,14,15,16,18,19,20}

Evaluate the following

(i)A B **(2 marks)**

(ii)U – (A C) **(3 marks)**

(iii) **|**A| **(2 marks)**

(iv)(A C) – B **(3 marks)**

(v)Is (B C) A ? Justify your answer. **(2 marks)**

(b)From a group of 191 students surveyed we obtain the following:

36 study Maths and Physics

20 study Maths and Chemistry

18 study Physics and Chemistry

65 study Maths

76 study Physics

63 study Chemistry

51 study none of the three

Draw the Venn diagram **(6 marks)**

and answer the following:

(i) How many study all three subjects? **(3 marks)**

(ii) How many study Maths and Chemistry but not Physics?

**(2 marks)**

(iii) How many study Physics but not Chemistry? **(2 marks)**

**(Total 25 Marks)**

**Q4.** (a)Given **a**(3,4) and **b**(-5, 7) find

(i)thedistance between a and b **(3 marks)**

(ii)the equation of the line parallel to line ab containing **c**(2,5)

**(4 marks)**

(b)Given two lines L: 5x + y = 6 and M: 2x + 3y = 5

(i)Write an equation for any line parallel to M **(3 marks)**

(ii)Write an equation for any line perpendicular to M **(4 marks)**

(iii)Write down the coordinates of the point where line M cuts the y-axis.

**(3 marks)**

(iv)Find the coordinates of the point of intersection of L and M.

**(8 marks)**

**(Total 25 Marks)**

**Q5.** (a) Using a matrix method (inverse method or Cramer’s Rule) solve the following:

2x + 6y = 22

-x + 5y = 53

**(10 marks)**

(b) Plot the graph of y = 3e0.5x for values of x in the range 0 x 4 using intervals of 0.5.

**(10 marks)**

(c) Given f(x) = 3e0.5x and g(x) = 3x + 7 find f(g(-3))

**(5 marks)**

**(Total 25 marks)**

**Formula Sheet**

**Set Theory**

|A B C| = |A| + |B| + |C| - |A B| - |A C| - |B C| + |A B C|

**Coordinate Geometry**

Distance between two points

Equation of a line y – y1 = m(x – x1)

Slope of a line m =

Midpoint of line

**Matrices**

Cramer’s Rule

x = y = z =