Mathematics for Software Development

BSc (Hons) Computer Games Programming

School of Engineering, Arts, Science and Technology

Answer all of the following questions, showing all of your working. Use extra sheets of paper if required (graph or squared paper may be used).

Hand out on Monday 14th October 2019

**To be completed by 09:00 Monday 21st October 2019**

Student ID …………………………………..

This problem set has 8 questions, for a total of 100 points.

**ASSESSMENT**

The majority of the summative assessment takes the form of regular problem sets assigned to students to be completed within a reasonable time frame, formative feedback will be available to them during tutorial sessions and workshops.

These problem sets will reinforce topics discussed in lectures and lead into a final exam of three hours, requiring students to answer a series of questions and provide their workings to demonstrate their understanding of the concepts underlying the questions being asked of them.

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| **Component Number** | **Form of assessment** | **Assessment size** | **Weighting (%)** | **Learning Outcomes assessed** |
| 1 | Problem Sets | 8 sets | 80% | 1, 2, 3 |
| 2 | Exam | 3 hours | 20% | 1, 2, 3 |

**ASSESSMENT CRITERIA**

1. Attempted to solve mathematical problems, making use of the correct underlying theories.
2. Submitted a series of solutions to assigned problem sets.
3. Produced solutions to problems, explaining their workings for each problem clearly and concisely.

Marks Awarded:

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| **Question** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **Total** |
| **Marks Available** | **5** | **5** | **10** | **15** | **15** | **15** | **15** | **20** | **100** |
| **Score** |  |  |  |  |  |  |  |  |  |

Question 1

If **V**1 = 2**i** + 5**j** + 3**k** , **V**2 = 3**i** + **j** + 2**k** and **V**3 = **i** - 2**j** + **k**

Calculate the following, answer in the space provided. [1 point each part]

1. **V**1 + **V**2

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1. **V**1 + **V**3

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1. **V**3 + **V**2

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1. **V**1 - **V**2

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1. **V**1 - **V**3

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Points awarded: \_\_\_\_\_\_\_\_\_ out of a possible 5.

Question 2

If **V**1 = 2**i** + 4**j** - 3**k** , **V**2 = 3**i** + 2**j** + **k** and **V**3 = **i** - 2**j** + **k**

Calculate the following, answer in the space provided. [1 point each part]

1. **2V1**

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1. **3V2**

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1. **7V3**

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1. **½V1**

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1. **-2V3**

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Points awarded: \_\_\_\_\_\_\_\_\_ out of a possible 5.

Question 3

Calculate the following magnitudes, answer in the space provided. [2 points each part]



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Points awarded: \_\_\_\_\_\_\_\_\_ out of a possible 10.

Question 4

Normalise the following, answer in the space provided. [3 points each part]



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Points awarded: \_\_\_\_\_\_\_\_\_ out of a possible 15.

Question 5

If **V**1 = 2**i** + **j** + 3**k** , **V**2 = 2**i** + 4**j** - 3**k** and **V**3 = 4**i** + **j** - 5**k**

Calculate the following, answer in the space provided. [3 points each part]

1. **V**1 • **V**2

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1. **V**1 • **V**3

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1. **V**2 • **V**3

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1. **V**1 • **V**1

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1. **V**3 • **V**2

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Points awarded: \_\_\_\_\_\_\_\_\_ out of a possible 15.

Question 6

If **V**1 = 2**i** + **j** + 3**k** , **V**2 = 2**i** + 4**j** - 3**k** and **V**3 = 4**i** + **j** - 5**k**

Calculate the following, answer in the space provided. [5 points each part]

1. The angle between **V**1 and **V**2

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1. The angle between **V**1 and **V**3

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1. The angle between **V**3 and **V**2

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Points awarded: \_\_\_\_\_\_\_\_\_ out of a possible 15.

Question 7

1. Vectors **V**1 and **V**2 are perpendicular to each other. If **V**1 = **i** + 7**j** + 2**k** and **V**2 = **i** + **j** + λ**k,** find the value of λ. [5 points]

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1. Show that the vector 13**i** + 23**j** + 7**k** is perpendicular to both 2**i** + **j** - 7**k** and3**i** - 2**j** + **k**. [10 points]

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Points awarded: \_\_\_\_\_\_\_\_\_ out of a possible 15.

Question 8

An object travels from the point (2, 3) to the point (7, 9). Another object travels from the point (14, 2) to the point (2, 7). Answer the following.

1. Plot these points using the squares below and draw the lines, use arrows to show the direction the objects moved in. [6 points]

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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

1. Write two vectors to represent these lines. [4 points]

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1. Using the scalar product of your vectors calculate the angle between the lines. [10 points]

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Points awarded: \_\_\_\_\_\_\_\_\_ out of a possible 20.