

## **M30242–GRAPHICS AND COMPUTER VISION**

### **Practice Questions**

## **Assignment Project Exam Help**

**Duration:** 120 minutes (90 minutes + 30 minutes for downloading and uploading)

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**Instructions:** Answer ALL Questions

**Additional Information:** This is an OPEN book examination

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**Note:**

1. The questions give an idea of the length of the exam, how the questions will be asked and the spread and depth of topics that will be in the examination. It isn't the case that the questions will appear in the exam, but the questions offer really good examples of exam questions and they can be used to think about how else a question could be asked (by varying the way that the topic area is explored and examined as students go through their revision). Exam preparation typically involves using those questions to question your own understanding in preparation for an exam.
2. The coverage of the exam will include all the lectures and topics, not limited to the topics show in this document.

**Instructions:**

**You see the full exam instructions at the exam time. Read it carefully. Here are few items that you may find useful**

- Download the exam paper file (a PDF file)
- Create a document named with your student number (e.g. 987654.docx); write your student number at the beginning of this document followed by your answers (which should be numbered clearly).
- Read carefully all the instructions on the front page of the exam paper.
- Do not write your name anywhere in the document.
- Your submitted file must be in PDF format. Maximum file size is 250MB.
- It is your responsibility to keep track of time during the exam. Please ensure that you upload your file in good time **before** the end of the exam - **late submissions will not be accepted.**

**Answer ALL questions**

**Total Mark = 50**

**Question 1**

In computer graphics, what model is used to define the surface properties of an object? Give an example.

**Question 2**

Figure 1 shows a binary image of which foreground and background are indicated by 1s and 0s (omitted), respectively. A labelling algorithm that assigns the same label to every pixel in a connected foreground component can be used to identify the components in such images. Using the image as an example, explain and illustrate the 4-connected labelling algorithm.

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Figure 1

**Question 3**

WebGL API provides two methods for drawing the primitives: `gl.drawArrays()` and `gl.drawElements()`. Compare these drawing methods and discuss the reason(s) why one method might be preferred to the other.

**Question 4**

One of the methods of filtering out high frequency noise from images is to average the pixels in some neighbourhood. In this context, analyse the influences of the size of neighbourhood and weights on the effects of filtering and give an example of such filters.

### Question 5

Explain the following transformation:

$$T = \begin{bmatrix} 2.0 & 0 & 0 & 1.0 \\ 0 & 0.5 & 0 & -3.5 \\ 0 & 0 & 1 & 0.0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

### Question 6

Shape-from-shading and shape-from-texture are two methods for 3D object reconstruction. Explain the methods in terms of the cues they use and the relationships between the cues and the shapes of objects and describe the conditions or assumptions that are necessary for them to work.

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### Question 7

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Discuss the factors that might affect the accuracy and reliability of detection when image subtraction is used for motion detection in outdoor environments. How could you improve the performance of the detector?

### Question 8

In a WebGL program, how would you implement the following: (a) translating a single object; and (b) translating the entire scene? Why?

### Question 9

What do texture coordinate systems  $u$ - $v$  and  $s$ - $t$  represent? What are the differences between them?

### Question 10

The Hough transform and its generalisation can be used to detect lines and other parametric shapes, i.e., shapes that can be expressed as functions of a few parameters.

- (a) Using line detection as an example to explain the algorithm.
- (b) Discuss the effects of quantisation of the parameters.

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