# M30242–GRAPHICS AND COMPUTER VISION

## Practice Questions



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



**Instructions:** Answer ALL Questions

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

**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**

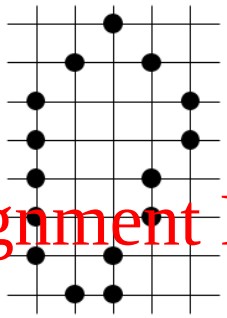
## Question 1

Figure 1(a) shows the sampled boundary of a shape.

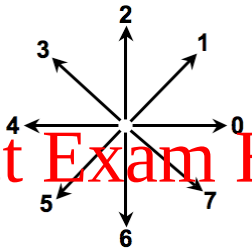
(i) Generate the Freeman chain code of the shape by traversing the object boundary clockwise using the 8-connected directions as in Figure 1(b).

(ii) Normalise the code so that it is invariant to start point and rotation.

(iii) Calculate the shape number



(a)




(b)

Figure 1



## Question 2

Histogram could be used to measure the similarity between two or more images.

(a) What is the meaning of the similarity measure “match”?

(b) What are the advantage(s) and disadvantage(s) of the approach?

## Question 3

When using texture in a WebGL program, how would setup the shaders?

**Question 4**

Figure 2 shows two triangle strips.

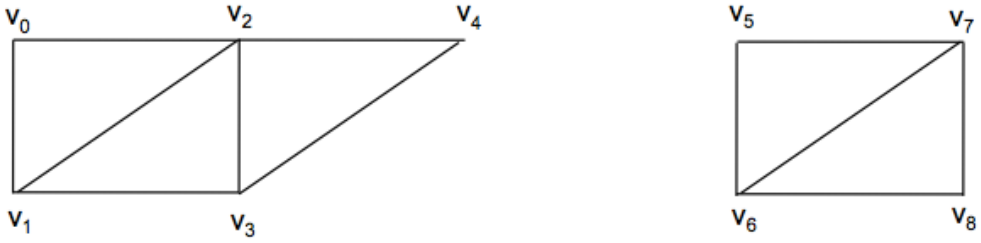



Figure 2

Suppose we want to raw both strips in a single call to the method:

```
drawElements(gl.TRIANGLE_STRIP, …)
```

Produce the list of vertex indices for the call and draw a diagram to show all the triangles.



**Question 5**

What are morphological operations for image processing? How closing and opening operation are defined? Discuss their uses.

**Question 6**

Both optical flow and image subtraction are methods for detecting motions of scene objects, or cameras or both. Given an example of application for each method and justify why one method is more suitable than the other.

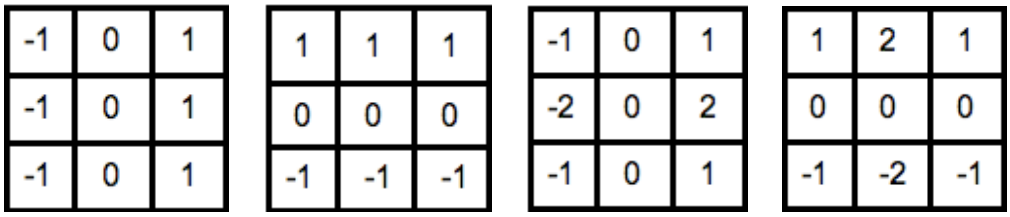
**Question 7**

Explain the *modelview* transformation in terms of its constituent transformations and their functions in the WebGL pipeline and indicate where and how the modelview transformation is used.

**Question 8**

Sobel and Prewitt masks (Figure 3) can be used for edge detection. Answer the following questions:

(I) Explain the masks and their usage.
(ii) Why do the masks work?
(iii) What is the meaning of the differences between the Sobel and Prewitt masks?




(a) (b) (c) (d)

Figure 3



**Question 9**



Vertex shader and fragment shader are two programmable units in the WebGL pipeline. What operations should be implemented in them?



**Question 10**

Compare the Gouraud shading model with the Phong shading model in terms of the ways in which the lighting calculation is performed and the visual realism that they produce.