

UNIVERSITY OF LONDON

GOLDSMITHS COLLEGE

B. Sc. Examination 2008

CREATIVE COMPUTING

IS52020A (CC227) Creative Computing 2

Duration: 3 hours

Date and time:

There are six questions in this paper; you should answer no more than FOUR questions. Full marks will be awarded for complete answers to a total of FOUR questions. Each question carries 25 marks; the marks for each part of a question are indicated at the end of the part in [.] brackets.

There are 100 marks available on this paper.

This is a practical exam; each answer requiring code should be saved in a Processing sketch named by question number, part and sub-part: for example, Q5_b_2.pde for part (b) sub-part (ii) of question 5. Save your answer to the exam submission folder. You are responsible for ensuring that your answers have been saved in the correct location.

Question 1 Colour and Perception

- (a) How are colours represented bitwise in *Processing*? [2]
- (b) Light of red, green and blue hues shines onto a white surface such that each beam lights up a square region of side 50 pixels, the top left corner being at pixel coordinates (20,10) for the red, (10,30) for the green, and (40,20) for blue. Write a *Processing* sketch to illustrate the colours reflected from the surface, assuming that no other light source is present. [10]
- (c) Discuss the limitations of the representation of colour in *Processing*. (Include references to optical perception and technical abilities of devices.) [13]

Question 2 Classes and Animation

- (a) For an object with position coordinates x and y and velocities dx , dy
- (i) Write down the update equations (in *Processing* format or otherwise) for x and y , given a timestep of 1; [2]
 - (ii) The acceleration has magnitude $\frac{1}{r^2}$, where r is the Euclidean distance of the object's position from the origin, and is directed towards the origin. Write down how to compute r^2 from x and y , and hence or otherwise write the update equations for dx and dy , again assuming a timestep of 1. [6]
- (b) Create a *Processing* sketch which defines a class named `Planet` with fields x , y , dx , dy ; implement a constructor for providing these fields with values, a `display` method which draws a black circle of radius 1 centered at x,y , and an `update` method which updates those fields implementing your answers to part (a). [9]
- (c) Hence or otherwise create a *Processing* sketch displaying an animation of two planets orbiting around the point at $(0,0)$; initialize the planets with the values shown in the table below. Ensure that a complete orbit is visible for both planets in your sketch. [8]

	x	y	dx	dy
Planet 1	49.0	0.0	0.0	0.142
Planet 2	0.0	64.0	0.125	0.0

Question 3 Sound and Music

- (a) Discuss the use of computers in the representation, synthesis, analysis, composition and dissemination of music. [25]

Question 4 Three-dimensional visualisation.

- (a) A square-based pyramid is a shape with four equilateral triangles meeting at a point above the centre of a square base.
- (i) An isosceles triangle has a base of length $\sqrt{2}$ and two sides of length 1. Calculate the height of the triangle. [3]
 - (ii) Write a *Processing* sketch to draw a scene with a square-based pyramid with side of length 40 directly resting on a cube of side of length 40. Include facilities for moving the camera around (based on keyboard or mouse input) to investigate the scene from all angles. [11]
 - (iii) Hence or otherwise state how many external plane faces (of whatever shape) the combined shape made from cube and square-based pyramid has. [1]
- (b) An octahedron is made up of two square-based pyramids with their square faces stuck together; a tetrahedron has four faces of equilateral triangles.
- (i) Write a *Processing* sketch to draw a scene with a tetrahedron stuck on to one of the faces of an octahedron, all with side length 40. Include facilities for moving the camera around (based on keyboard or mouse input) to investigate the scene from all angles. (You may find it helpful to construct the individual shapes with some edges along axes, and then the overall scene by rotating and translating the shapes into position.) [8]
 - (ii) Hence or otherwise state how many external plane faces (of whatever shape) the combined solid made from octahedron and tetrahedron has. [2]

Question 5 Image Processing

- (a) Write a *Processing* function taking a `PImage` argument and returning an array of integers, where each element of the array is the count of the number of black pixels in the corresponding line of the image argument. [6]
- (b) Describe what your function should return in the following circumstances:
- (i) an image with some precisely horizontal black lines on a white background;
 - (ii) an image with some precisely horizontal black lines and some additional sparsely-distributed black pixels;
 - (iii) an image with some black lines which are rotated by a small amount from the horizontal. [6]
- (c) Write a *Processing* sketch to display the provided image rotated about its centre point by an arbitrary whole number of degrees. [5]
- (d) Hence deduce the angle through which the provided image should be rotated to make the long black lines as close to horizontal as possible. You may assume that the answer is a whole number of degrees between -10° and 10° inclusive. Include in your submitted materials (paper or electronic) how you arrived at your answer. [8]

Question 6 Online Social Networking Design

(a) Present an extension which adds a new dimension to an aspect of online social networking. Discuss your idea in context:

- which community of people does your idea target?
- which aspect of social networking does it address?
- which existing tools have attempted to address this aspect?

Describe how your idea would improve any of the following spheres:

- design and planning;
- scalability and maintainability;
- usability and interaction;
- culture, society or ethics;

Discuss the benefits of your idea. For example, you may consider the following:

- does it offer solutions to existing problems?
- does it provide a greater focus for content?
- does it initiate a debate?
- does it respond to users' needs?
- is it easily applicable?

You may add sketches to illustrate your ideas.

[25]