UNIVERSITY OF LONDON

GOLDSMITHS COLLEGE

B. Sc. Examination 2008

CREATIVE COMPUTING

IS51012A (CC112)   Creative Computing 1

Duration: 3 hours

Date and time:

Answer Question 1 (multiple choice) and any three (3) other questions. You are to answer a total of four (4) questions, of which one must be Question 1.
Each part of Question 1 is worth 4 marks (32 marks in total) and each other question is worth 36 marks (108 marks in total).

The examination total is 140 marks.

This is a practical exam. You should enter all answers that require code into a Processing sketch named by question number, part and sub-part. For example, Q5bii.pde for Question 5 part b sub-part ii. Save your answer to the EXAM SUBMISSION FOLDER. Save Early, Save Often. You are entirely responsible for making sure your answers are saved in the correct location.

Answers that do not require code should be written as normal on an exam booklet.

You may make use of the online reference manual (API) at `www.processing.org`

THIS EXAMINATION PAPER MUST NOT BE REMOVED FROM THE EXAMINATION ROOM

QUESTION 1 Multiple choice.

For each question, choose ALL the possible correct answers. **Some questions may have more than one correct answer.**

Write down only the letter(s) corresponding to the correct answer(s) for each of the questions.

NOTE: marks will be deducted for incorrect answers.

(a) For the picture in file "lc.jpg", what is its size?

    (i) width = 200; height = 200

    (ii) width = 315; height = 487

    (iii) width = 512; height = 512

    (iv) width = 250; height = 351

    (v) width = 0; height = 0

    (vi) none of the above

[4 Marks]

(b) For the picture in file "lc.jpg", if you were to load it into a `PImage` variable in a *Processing* sketch, what would be the length of the `pixels[]` array field?

    (i) 400

    (ii) 40000

    (iii) 87750

    (iv) 153405

    (v) 262144

    (vi) none of the above

[4 Marks]

(c) Which of the following methods use(s) of `background()` in *Processing* are correct?

    (i) `background(#2A596D);`

    (ii) `background(red);`

    (iii) `background(''red'');`

    (iv) `background(139);`

    (v) `background(red, 255);`

    (vi) `background(255, 255, 255, 255);`

    (vii) `background(255, 255, 255, 255, 255);`

[4 Marks]

(d) For CD quality audio, which of the following sample rates is/are most commonly used?

   (i) 3.162 dB

  (ii) 44100 dB

 (iii) 44100 kHz

 (iv) 44.1 kHz

  (v) 96000 Hz

 (vi) 48000 Hz

(vii) 44100 Hz

[4 Marks]

(e) Which of the following program(s) contain recursion?

  (i)
```
/**
 * Iteration.
 * Iteration with a "for" structure constructs repetitive forms.
 */

int k;
int xpos1 = 100;
int xpos2 = 118;
int count = 0;
int timey = 0;
int num = 12;

size(200, 200);
background(102);
noStroke();

// Draw gray bars
fill(255);
k=60;
for(int i=0; i < num/3; i++) {
  rect(25, k, 155, 5);
  k+=10;
}

// Thin lines
k = 42;
fill(0);
for(int i=0; i < num-1; i++) {
  rect(36, k, 20, 1);
  k+=10;
}
```

(ii)
```
void draw()
{
  // Call the variableEllipse() method and send it the
  // parameters for the current mouse position
  // and the previous mouse position
  variableEllipse(mouseX, mouseY, pmouseX, pmouseY);
}

// The simple method variableEllipse() was created specifically
// for this program. It calculates the speed of the mouse
// and draws a small ellipse if the mouse is moving slowly
// and draws a large ellipse if the mouse is moving quickly

void variableEllipse(int x, int y, int px, int py)
{
  float speed = abs(x-px) + abs(y-py);
  stroke(speed);
  ellipse(x, y, speed, speed);
}
```

(iii)
```
/**
 * Renders a simple tree-like structure
 * Branching angle calculated as a function of horizontal mouse location
 */

float theta;
void setup() {
  size(200,200);
  smooth();
}
void draw() {
  background(0);
  frameRate(30);
  stroke(255);
  float a = (mouseX / (float) width) * 90f;
  theta = radians(a);
  translate(width/2,height);
  line(0,0,0,-60);
  translate(0,-60);
  branch(60);
}
void branch(float h) {
  h *= 0.66f;   // Each branch will be 2/3 the size of the previous one
  if (h > 2) {
```

```
        pushMatrix();    // Save the current state of transformation
        rotate(theta);   // Rotate by theta
        line(0,0,0,-h);  // Draw the branch
        translate(0,-h); // Move to the end of the branch
        branch(h);       // Draw a new branch
        popMatrix();     // Whenever we get back here, we "pop" in
                         // order to restore the previous matrix state
 }
}
```
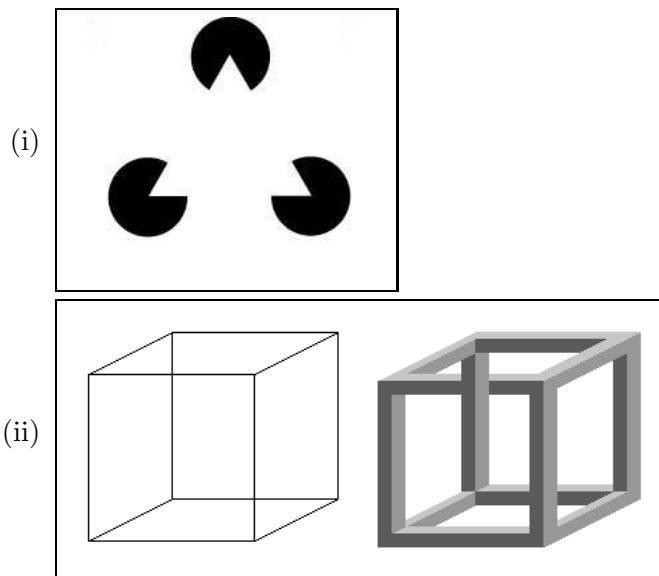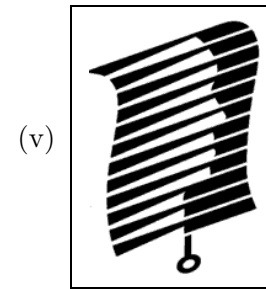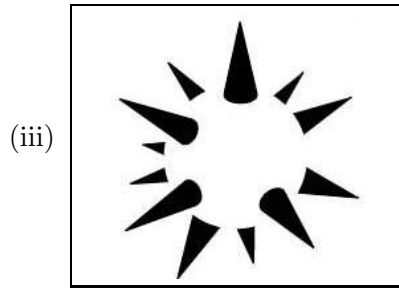
[**4 Marks**]

(f) What will the *Processing* code `text(name,10,10,10,5,100);` do?

  (i) Write the word "name" into the *Processing* screen.

  (ii) Write the contents of the variable `name` into the *Processing* screen.

  (iii) Terminate with an error message.

  (iv) Write the word "name" into the text area of the *Processing* environment.

  (v) Write the contents of the variable `name` into the text area of the *Processing* environment.
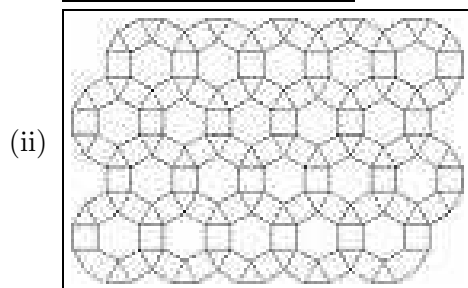
[**4 Marks**]

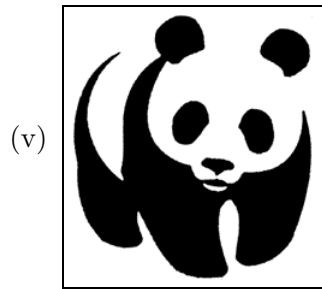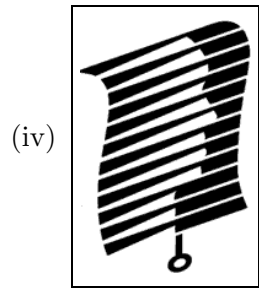(g) Which of the following images illustrate the Gestalt principle of reification?

(i)

(ii)

(iii)

(iv)

(v)

[**4 Marks**]

(h) Which of the following images is/are examples of tessellation?

(i)

(ii)

(iii)

(iv)

(v)
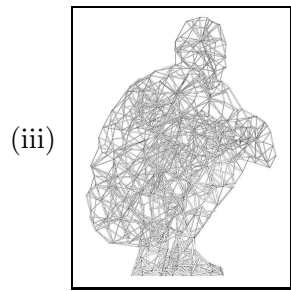
[4 Marks]

QUESTION 2 Colour

(a) *Processing* supports two colour models: RGB and HSV. Explain what each of these models is. When would you choose to use RGB and when would you choose to use HSV?

[**4 Marks**]

(b) In the resources folder, there is a file called "`colour.jpg`", which is a JPEG image. Use the formulae given below, to write a *Processing* sketch that takes the image, and converts it to a sepia image.
RNew = (R * 0.393 + G * 0.769 + B * 0.189);
GNew = (R * 0.349 + G * 0.686 + B * 0.168);
BNew = (R * 0.272 + G * 0.534 + B * 0.131);

[**17 Marks**]

(c) Now take the same image from (b) above and make it monotone red.

[**10 Marks**]

(d) Discuss why one would want to produce monotone images.

[**5 Marks**]

QUESTION 3 Time and Motion

(a) What do each of the following method calls do in a *Processing* `draw()` loop?

   (i) frameRate(20);

                                                          [2 Marks]

   (ii) println(frameRate);

                                                          [2 Marks]

   (iii) frameRate(frameRate);

                                                          [3 Marks]

(b) Consider the following *Processing* code:

```
float x=32, y=128; // Global variables
float dx,dy;       // rate of change of position (velocity)
float gravity = 5;  // rate of change of velocity (acceleration)
float ballSize = 20;// size of ball
void setup(){
 size(512,512,P3D);
 fill(255);noStroke();
 frameRate(20);background(0);
 // initial conditions
 dx=5;
 dy=10;
}
// draw called repeatedly at the frame rate, 10 Hz
void draw(){
background(0);
translate(x,y);
ellipse(0,0,ballSize,ballSize);
if(x>width-ballSize/2 || x<ballSize/2)
  dx=-dx;
if(y>height-ballSize/2)
  dy=-dy;
else
  dy+=gravity; // amount to change acceleration by
 x+=dx; // amount to change x position each step
 y+=dy; // amount to change y position each step
}
```

(i) Modify the given code, including comments, to make a bouncing ball that loses some of its height with each bounce as a real ping pong ball would if it were dropped onto a hard floor.

[**12 Marks**]

(ii) Modify the given code, including comments, so that it takes the ball one minute to travel from the left edge of the screen to the right and back to the left edge of the screen again. Your answer should attempt to control the speed of the ball using the frameRate() method. Answers can be accurate to within a few seconds.

[**17 Marks**]

QUESTION 4 Shape and response.

(a) Explain what `mousePressed` and `mousePressed()` are in *Processing*, and what they do. Be clear about what the difference is between these.

[**6 Marks**]

(b) The code in "`gesture.pde`" produces animated gestures. Take the code and alter it as follows:

 (i) Add a `noLoop();` call at an appropriate point in the code, that will freeze the screen, thereby creating a version of painting by gesture. The call should be in response to a keypress or mouse input; whichever you choose, make it clear in your comments, or on your exam script, what input causes the freezing.

[**4 Marks**]

 (ii) Taking the same code, now incorporate the use of other techniques to make a new kind of painting by gesture. Include at least two new aspects in your extension; examples include the use of colour, the use of shape, the use of swarms, etc. Describe what you have done, and discuss what you are trying to do from a creative perspective. Link what you have done to other art and artworks that you have seen.

[**26 Marks**]

QUESTION 5 Recursion, iteration and pattern

(a) For a 1 dimensional cellular automaton, using 3 bits, there are 256 possible rules. This number comes from the fact that for a cell, having 2 neighbours (one either side, in the 1 dimensional case), this gives $2^3 = 8$ possible patterns, and so we have 2^8 rules.

Now consider the 2 dimensional case, which Conway's game of life utilises.

  (i) How many immediate neighbours are there?
  (ii) How many possible patterns are there?
  (iii) How many possible rules are there? Restrict your consideration to patterns only involving immediately neighbouring cells.

Please show your working.

[**6 Marks**]

(b) In Conway's game of life, only 4 of the possible rules are actually used.

  (i) What are these rules?

[**4 Marks**]

  (ii) What would happen if other rules were used? Use examples where appropriate to clarify your answer.

[**4 Marks**]

(c) Consider the code in `penrose.pde`. Explain briefly what the code is doing, and what the L-system it implements is. In particular, give the equations for the L-system.

[**12 Marks**]

(d) Consider the code in `tree.pde`. The code draws a tree that is symmetrical about the vertical centre. Modify the code so that it draws a tree that is not symmetrical, in a pseudo-random way.

[**10 Marks**]

QUESTION 6 Data, sound and text

(a) Choose one of the images from the following, contained in your resource folder, as the basis of a picture to which you then add appropriate text. Write a *Processing* sketch to do this, and make a contextual piece of art. Your choice of text should support the impact you are trying to make. Discuss what you are doing from a creative perspective.

```
picture1.jpg
picture2.gif
picture3.jpg
```

[**14 Marks**]

(b) What is the difference between lossy and lossless compression? Give examples of formats of each; you may use audio or picture as the basis. When is it appropriate to use which kind of compression?

[**10 Marks**]

(c) Write a *Processing* sketch that will read a short file of text, and write it to the screen. An example text file is given in "`text`". Discuss your choice of how the text is actually written to the screen, from an aesthetic and functional perspective.

[**12 Marks**]