UNIVERSITY OF SWAZILAND

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

FINAL EXAMINATION, 2011

Title of Paper	:	Computer Graphics
Course Number	:	CS 246
Time Allowed	:	Three Hours
Instructions	:	Answer **ALL** questions from Section A Answer **only THREE** questions from Section B Each question is worth **20 marks**
Special requirement	:	Graph paper

This paper should not be opened until permission has been granted by the invigilator
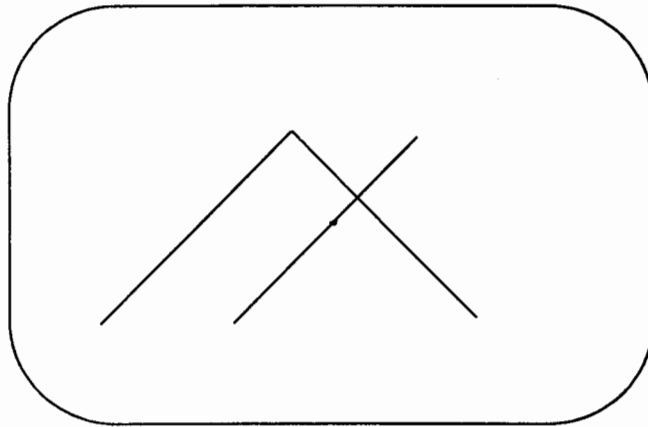
Section A

Question 1.
a)   Define an API?   *[3]*
b)   Why is it so difficult yet so important to produce a good user interface?   *[8]*
c)   Why should we study API alongside computer graphics?   *[3]*
d)   Distinguish computer graphics from its closely related counterpart, namely image processing. Give two applications from each discipline.   *[6]*

Question 2.
a)   Compare and contrast raster graphics and vector graphics (paying special attention to how each one flourished or was a failure during its era).   *[6]*
b)   Briefly describe how a CRT works in conjunction with a vector display.   *[4]*
c)   Draw the input control signals which would produce the following output on a vector graphics display.   *[10]*

The first two lines are parallel; the third intersects the first two at right angles.

Section B

Question 3.
- (a) Vector display started off with some problems which were quickly ratified by technological improvements. However, despite these technological advancements vector graphics was disused due to two serious disadvantages – discuss these two serious disadvantages. **[4]**
- (b) Briefly discuss the meaning of the term raster graphics. **[4]**
- c) Draw the diagram resulting from the following five segments and compute the coordinates (don't read them from the diagram) of their points of intersections, if any: **[12]**
  - i) the line $x = y$ clipped to the rectangle defined by $(0,0)$ and $(12, 15)$
  - ii) segment joining the points $(0,4)$ and $(6,10)$
  - iii) segment defined by:

$$\binom{x}{y} = \lambda\binom{1}{7} + \binom{4}{1}; 0 \leq \lambda \leq 1$$

  - iv) segment joining the points $(8,13)$ and $(14,6)$
  - v) the line $x = 17$ clipped between the lines $y = 3$ and $y = 13$.

Question 4.
- a) Compute the coordinates of the image of $(3,2)$ after each of the following transformations:
  - – rotation around the point (4,1) through an angle of 90°;
  - – rotation around the point (3,2) through an angle of 90°. **[4]**
- b) Find the transformation matrix for rotation around the point (x,y) over an angle θ. **[6]**
- c) Draw the diagram resulting from joining the following points: $(5,7)$, $(5,4)$, $(2,1)$ and $(2,3)$ and draw the image that will result after performing the following transformations in succession:
  - – scaling by scale factor 2;
  - – clipping using the clipping window $(0,0) - (10,10)$;
  - – rotation through 90°, around the origin. **[10]**

Question 5.
> Describe three different interface dialogues with their suitable application areas stating all the advantages (and possible disadvantages) that each of them has over the other two in the application area that you have chosen. **[20]**

Question 6
- a) Describe the differences and similarities between a scanner and a frame-grabber. **[8]**
- b) Describe two examples of situations where a loudspeaker would be the best form of output stating why you think the loudspeaker would be the best form of output in that situation, say over a printer. **[4]**
- c) Discuss four user interface design principles **[8]**