

UNIVERSITY OF SWAZILAND

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

FINAL EXAMINATION, 2013

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

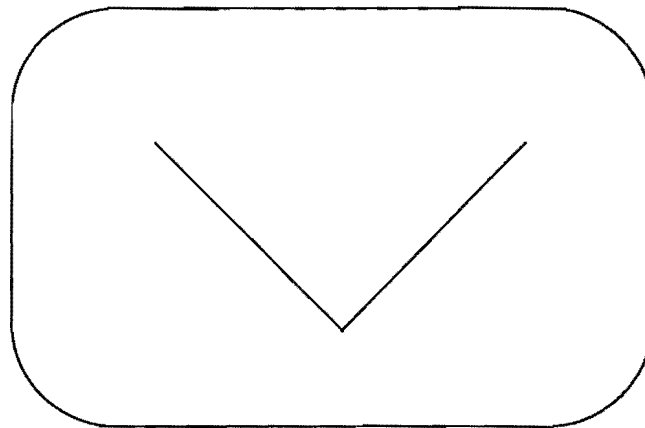
Section A

Question 1.

- (a) Why is it so difficult yet so important to produce a good user interface? **[8]**
- (b) Why don't we recognize some of the object we look at? **[2]**
- (c) Why should we study user interfaces alongside computer graphics? **[2]**
- (d) Distinguish computer graphics from image processing **[5]**
- (e) Define an API. **[3]**

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]**



Assume the two lines meet at an angle of 90°

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]
- the line $x = y$ clipped to the rectangle defined by $(0,0)$ and $(10, 10)$
 - segment joining the points $(0,4)$ and $(6,10)$
 - segment defined by:

$$\begin{pmatrix} x \\ y \end{pmatrix} = \lambda \begin{pmatrix} 1 \\ 7 \end{pmatrix} + \begin{pmatrix} 4 \\ 1 \end{pmatrix}; 0 \leq \lambda \leq 1$$

- segment joining the points $(5,13)$ and $(12,6)$
- the line $x = 12$ clipped between the lines $y = 3$ and $y = 10$.

Question 4.

- a) Compute the coordinates of the image of $(4,1)$ after each of the following transformations: [6]
- rotation around the point $(4,1)$ through an angle of 90° ;
 - rotation around the point $(3,2)$ through an angle of 90° .
- b) Find the single transformation matrix for rotating a point around an arbitrary point (x,y) over an angle θ . [8]
- c) Using your result from (b) compute the image of $(2,2)$ rotated over 60° around the point $(4,0)$ [6]

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]