UNIVERSITY OF SWAZILAND

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

MAIN EXAMINATION, 2012

Title of Paper	:	***Computer Graphics***
Course Number	:	***CS246***
Time Allowed	:	***Three (3) Hours***
Instructions	:	*Answer **ALL** questions in Section A* *Answer **only THREE** questions from Section B* *All questions are worth **20 marks***
Special requirement	:	***Graph paper***

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

SECTION A

Answer all questions from this section.

Question 1.
  (a)   Discuss the differences between direct manipulation, menu driven and command driven user interfaces.   [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)   Good user interfaces are difficult to produce due to some technical and human problems. Describe any two technical problems of this nature;   [5]
  e)   Why was vector graphics discontinued?   [3]

Question 2
  (a)   How does a raster graphics display work?   [8]
  (b)   Vector display was a great improvement over and above printers as a form of output. Despite this improvement over printers, computer graphics was not of widespread use during the vector display era. Explain giving three reasons, why graphics was not of widespread use.   [6]
  (c)   Use a graph paper to draw the input signals to produce the following on a crt.
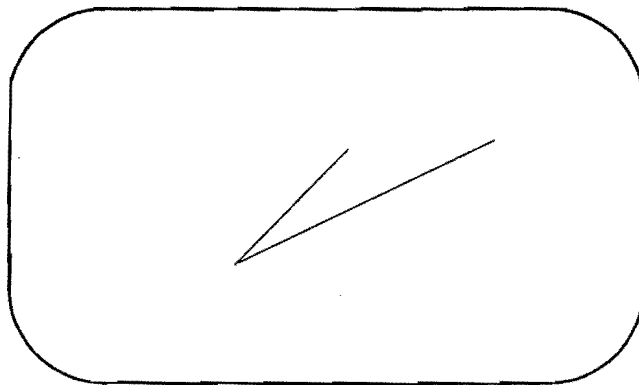
                                                                        [6]

SECTION B

*Answer any **three** questions from this section.*

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) Lines are an important aspect of computer graphics – hence their quality. List four criteria for judging a good line drawing algorithm. **[4]**

(b) Show that the Bresenham line drawing algorithm is purely integer arithmetic i.e., there are no fractions and no multiplications. **[8]**

(c) Draw the line segments between the following points using the recursive line drawing algorithm:

– (0, 0) to (5, 8)

– (1, 3) to (6, 9). **[6]**

(d) Explain why the end points will always be drawn in the Bresenham's algorithm. **[2]**

Question 5

(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 30°. **[4]**

(b) Find the transformation matrix for rotation around the point (x, y) over an arbitrary angle x. **[4]**

(c) Using the results in a) and b) find the sines and cosines of 90^0 & 30^0. **[12]**

Question 6

(a) Group, describe and differentiate the following devices: scanner, loudspeaker, data-glove, plotter, and frame-grabber. **[8]**

(b) Give an example of a situation where a loudspeaker would be the only best form of output stating why you think the loudspeaker would be the best in that situation. **[4]**

(c) Discuss four user interface design principles. **[8]**