

UNIVERSITY OF SWAZILAND

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

SUPPLEMENTARY EXAMINATION, 2011

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

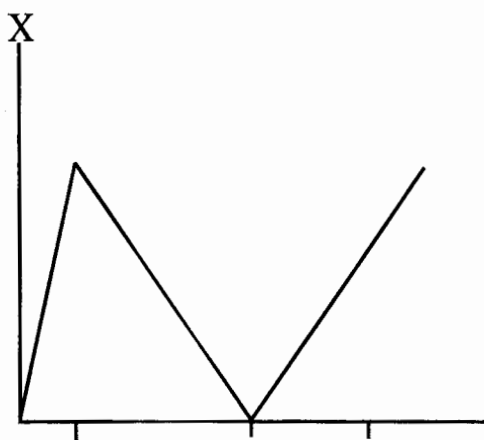
Answer *all* questions from this section.

Question 1.

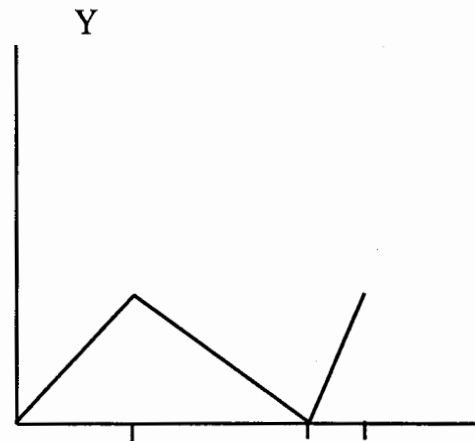
- (a) Discuss the differences between direct manipulation, menu driven and command driven user interfaces. [8]
- (b) Why don't we recognize some of the object we look at? [2]
- (c) Why should we study user interfaces alongside computer graphics? [2]
- (d) Good user interfaces are difficult to produce 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 output resulting from the following signals, indicating all important points, time marks are all at corresponding equal times:



X-signal



Y-signal

Intensity



Intensity signal

[6]

SECTION B

Answer any three questions from this section.

Question 3

- (a) Vector graphics, though later disused, was a great improvement from the era of working with hard copy outputs only – in what way(s) was vector displays superior to printers? [4]
- (b) Sizes of CRTs are normally given by the length of their diagonal (the ratio of the width and height is standardized at 2:3). With a 14" tube and a 640 x 480 frame buffer, what are the horizontal and vertical resolutions? What area of the screen should be used to get an aspect ratio of 1:1? [10]
- (c) How much memory is needed for a 1024x1024 frame buffer with depth 5? [6]

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 divisions nor 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° & 30°. [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]