UNIVERSITY OF SWAZILAND

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

SUPPLEMENTARY EXAMINATION, JULY 2015

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.
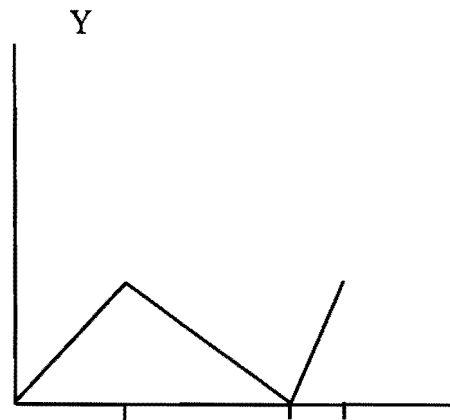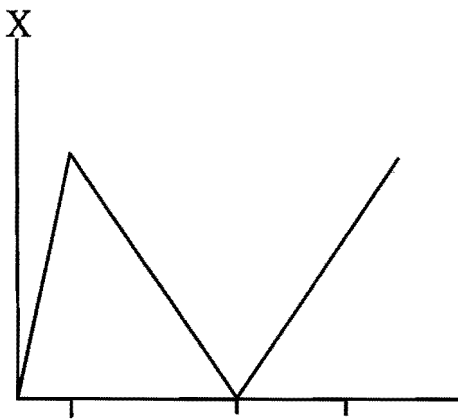
SECTION A

*Answer **all** questions from this section.*
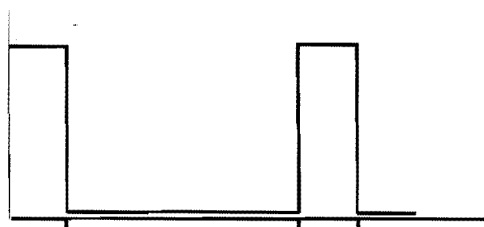
Question 1.
     (a)   Discuss the differences between direct manipulation, menu driven and command driven user interfaces.   **[8]**
     (b)   Briefly describe how people see objects.   **[2]**
     (c)   Why should we study user interfaces alongside computer graphics?   **[2]**
     (d)   Good user interfaces are difficult to produce due to some technical and human problems. Describe any:
         –   two technical problems of this nature;   **[5]**
         –   one human problem which contributes to this.   **[3]**

Question 2
     (a)   How does a vector graphics display work?   **[8]**
     (b)   Vector display was a great improvement over 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: **[6]**

Intensity

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. **[8]**

(b) Briefly discuss the meaning of the term raster graphics. **[6]**

(c) How much memory is needed for a *640* x *480* frame-buffer with depth 3? **[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 multiplications. **[8]**

(c) Draw the line segments between the following points using the recursive line drawing algorithm:
-   (10, 10) to (15, 18)
-   (3, 3) to (9, 8). **[6]**

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

Question 5

(a) Find the transformation matrix for rotation around the point (*x, y*) over an arbitrary angle. **[8]**

(c) Draw the diagram resulting from joining the following points: (*5, 7*), (*5, 4*), (*2, 1*) and (*2, 3*) and draw the images that will result after performing the following transformations in succession (one image after the other):
-   scaling by scale factor 2;
-   clipping using the clipping window (0, 0) – (10, 10);
-   rotation through 90°, around the origin. **[12]**

Question 6

(a) Group, describe and differentiate the following devices: scanner, loudspeaker, data-glove, plotter, and frame-grabber. **[10]**

(b) Discuss four problems UI designers face when designing an interface. **[10]**