

UGANDA MARTYRS UNIVERSITY
FACULTY OF SCIENCES
DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION
SYSTEMS

END OF SEMESTER FINAL EXAM

SEMESTER II, 2021/22

Bsc. IT & CS -Yr. III

INSTRUCTIONS:

PAPER:	COMPUTER GRAPHICS AND ANIMATION
PAPER CODE:	CS 3201
DATE:	19 JULY/2022
TIME:	3 HRS

- 1. ATTEMPT ALL QUESTIONS IN SECTION A (40 MARKS)**
 - 2. ATTEMPT THREE (03) QUESTIONS IN SECTION B (60 MARKS)**
 - 3. DO NOT OPEN THIS EXAM UNTIL YOU ARE TOLD TO DO SO**
 - 4. ALL ROUGH WORK SHOULD BE IN YOUR ANSWER BOOKLET**
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CASE STUDY

Dorne-Akanks Graphics systems limited is a recently registered graphics company whose main goal is to provide graphics solutions. The company is in the wake to recruit experts in all graphics application fields. Given that you have been selected to head the technical graphics interview team, prepare solutions to the following questions that are to be used during the upcoming interviews.

SECTION A

QUESTION ONE

- a) Using a diagram illustrate with explanations the OpenGL rendering pipeline [3 Mks]
- b) With use of a diagram discuss the graphics conceptual framework [3 Mks]
- c) Explain any four application of computer graphics [4 Mks]
- d) Discuss any four basic output primitives as applied in computer graphics [4 Mks]
- e) With examples differentiate between the two types of graphics systems that graphics system developers need to consider [4 Mks]
- f) Using a diagram, illustrate the three key components of a modern graphics display system [3 Mks]
- g) Describe the three properties of a video monitor that graphics system developers need to consider [3 Mks]
- h) Given that, in a given image display, the width unit is 1000 pixels and height unit is 3750 pixels. Calculate the aspect ratio of the image [2 Mks]
- i) Given that an image size with points $a = (4, z)$ and $b = (-2, -1)$ stretches for 10 centimeters on a cartesian plane, find the exact cartesian points for x [4 Mks]

j) Explain any two reasons why graphics developers should consider use of spline curves [2 Mks]

k) Using an example, explain the concept of data gloves as used in graphics systems [2 Mks]

l) Write the Correct Multiple choice for each of the following: [$\frac{1}{2}$ Mk] @

(i) gives a three-dimensional effect to a text or an image by using highlights and shadows on the sides of the illustration.

(A) Contrast (B) Emboss (C) Palette (D) None of All

(ii) technique that reduces the jagged effect of edges and makes them appear to have better resolution

(A) Anti-Aliasing (B) Alpha Blending (C) Trimming (D) All Options

(iii) In digital photography... tool is used to remove portions of an image

(A) e-photo (B) Remover (C) Crop (D) None of All

(iv) is the intensity of hue

(A) Intenser (B) Saturation (C) Resolution (D) All Options

(v) is a graphics compression technique, where graphics detail and quality is maintained

(A) Lossless (B) Maintaner (C) Lossy (D) All Options

(vi) is a graphics compression technique, where graphics detail and quality is not maintained

(A) Lossless (B) Maintaner (C) Lossy (D) All Options

(vii) helps remove hidden surfaces by sorting polygons in back-to-front order prior to rendering

(A) Z-sorting buffer (B) Z-sorting (C) A-sorting (D) K-buffer

(viii) A display controller serves to pass the contents of

(A) Frame buffer to Monitor (B) Monitor to Frame buffer (C) Monitor to buffer
(D) None of All

(ix) is the lowering of intensity as objects move away from the viewpoint.

(A) Clipping (B) Chroma Keying (C) Depth Cueing (D) All Options

(x) involves removing a colour from one image to reveal another image "behind" it

(A) Depth Cueing (B) Chroma Keying (C) Clipping (D) All Options

(xi) is a technique for archiving 24-bit quality in 8 or 16-bit frame buffers.

(A) Dithering (B) Chroma Keying (C) Gamma Correction (D) All Options

(xii) is a mathematical model commonly used in computer graphics for generating and representing curves and surfaces.

(A) MRI (B) CAT (C) NURBS (D) None of All

SECTION B

QUESTION TWO

- a) Given two image locations in 3D, name $a = [12, 13, 14]$ and $b = [15, 16, 17]$
 - (i) Calculate the cross product of the image [3 Mks]
 - (ii) Calculate and state the angle between the two image locations [5 Mks]
- b) Explain the two graphics card types that graphics system developer should consider [4 Mks]
- c) With an example in each, discuss the two complementary points of view for describing object transformation that graphics system developers need to consider [4 Mks].
- d) With the help of diagrams, discuss the two types of image scanners that graphics system [4 Mks]

QUESTION THREE

- a) Given that, Chak-Ria Graphics systems limited is work on a 3D graphics product represented on a cartesian plane by three simultaneous equations namely, i) $x-3y+3z=-4$, ii) $2x+4y-z=15$, iii) $4x-5y-z=19$. Use a matrix approach to find value for x , y and z in the simultaneous equations [6 Mks]
- b) Explain the concept of Homogenous Coordinates as used in graphics systems [3 Mks]
- c) With use of diagrams, discuss the two major types of parallel projection [4 Mks]
- d) (i) Discuss any four Types of Coherence as used in graphics system hidden surface removal [4 Mks]

(ii) With examples, discuss the concept of affine transformations as used in computer graphics systems [3 Mks]

QUESTION FOUR

- a) With use of a diagram, discuss parts of a display processor as used in computer graphics systems [4 Mks]
- b) Explain any four properties, of a good line drawing algorithm that graphics system developers need to consider [4 Mks]
- c) Identify any three algorithms for line drawing that graphics system developers need to consider [3 Mks]
- d) (i) Explain the pros and cons of DDA algorithm that graphics system developers need to consider [4 Mks]
(ii) With support of diagrams, explain two methods by which graphics system developers can identify whether a particular point is inside an object or outside [5 Mks]

QUESTION FIVE

- a) Given a polygon of three points represented with vectors of $a = [17, 13]$, $b = [12, 10]$, and $c = [14, 24]$
 - i. Rotate the points based on the angle of 90 degrees anti-clock wise [3 Mks]
 - ii. Translate the points using a factor of 7 in x direction and 8 in y direction [3 Mks]
 - iii. Reflect the points through the y axis [3 Mks]
- b) Using diagrams, discuss three types of lines as considered in graphics clipping [4 Mks]

- c) Discuss any three pointing devices which graphics system developers need to consider [3 Mks]
- d) Discuss any four types of sorting algorithms that graphics system developers need to consider [4 Mks]

QUESTION SIX

- a) Given four 2-dimension points A0, A1, B0, and B1. Design a robust procedure to determine whether the line segments A0, A1 and B0, B1 intersect [3 Mks]
- b) Give that matrix A has point 10 for X and 6 for Y and matrix B has 7 for its X and 6 for Y components. Prove that $A^{-1} \times A = I$ [4 Mks]
- c) Explain any four principles of animation that graphics system developers need to consider [4 Mks]
- d) (i) Describe any four animation functions that graphics system developers need to consider [4 Mks]
(ii) Discuss any five animation techniques that graphics system developers need to consider [5Mks]

END

SUCCESS