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UNIVERSITY EXAMINATIONS: 2025/2026

EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

BBIT400

COMPUTER GRAPHICS AND ANIMATION

DATE: FRIDAY,AUGUST, 2026 **TIME: 3 HOURS**

INSTRUCTIONS: Question One is Compulsory, Choose Three Other Questions

Online Exam Paper

SECTION A (COMPULSORY)

SECTION A
(Answer ALL questions in this section)

Question 1 (15 Marks)

a) Describe two types of computer animation. For each type, provide a specific example of where it is effectively used in the media or entertainment industry. (3 Marks)
b) Distinguish between Emissive and non-emissive displays. In your answer, explain the underlying mechanism of how light is produced in each type and suggest a suitable application for both. (3 Marks)
c) Critically evaluate three fundamental differences between 2D and 3D graphics. Your answer should reference data storage requirements, mathematical modeling, and rendering complexity. (3 Marks)
d) To create a more convincing animation of a bouncing ball, you need to make the ball bounce more sharply off the ground (simulating elasticity) and speed up the ball's horizontal movement as it falls. i. Identify the specific animation tool or technique you would use to control these

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properties. ii. Explain the physics principles behind "squash and stretch" and "timing" in this context and how the tool helps achieve them. (3 Marks)

e) Explain any two core concepts of animation (e.g., Keyframing, Tweening, Storyboarding). Discuss how these concepts contribute to the workflow efficiency of a graphic designer. (3 Marks)

SECTION B

(*(Answer any THREE (3) questions in this section)*

Question Two (15 Marks)

a) Consider two raster systems with resolutions of 1280 x 720 and 2048 x 1536.

i. Describe two primary methods of refreshing a display screen. For each method, analyze its impact on system performance and potential for screen flicker. (4 Marks)

ii. How many pixels could be accessed per second in each of these systems by a display controller that transfers pixels at a refresh rate of 120Hz? Show your calculation. Furthermore, compare the memory bandwidth requirements for the two resolutions. (4 Marks)

b) Film animators historically used a variety of methods for depicting and emphasizing motion sequences before the digital age. Discuss three traditional animation techniques, giving example (e.g., Cel (7 Marks)

Question Three (15 Marks)

a) Distinguish between the following terms
   i. Simulation and animation (2 marks)
   ii. Window port and view port (2 marks)
b) Given 3D geometric primitives explain how you would generate an image using the 3D rendering pipeline. (6 Marks)
c) Window port and View port: Explain their relationship in the mapping process from world coordinates to device coordinates. (5 Marks)

Question Four (15 Marks)

a) Given a polygon with the vertices (0,0), (0,1), (1,0) and (1,1). Draw the shape obtained after transforming this unit square with the homogeneous matrix M given below. (5 Marks)

$$\mathbf{M} = \begin{pmatrix} 1 & 0 & 2 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} 3 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} \cos(90) & -\sin(90) & 0 \\ \sin(90) & \cos(90) & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

b) Rasterize a line having end points (10,20) and (16,25) and plot the resultant pixels using Bresenham's algorithm. (5 Marks)

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c) Explain why Bresenham's algorithm is preferred over the DDA algorithm in terms of computational efficiency. (5 marks)

Question Five (15 marks)

a) John wants to acquire a graphics display device, explain five factors he needs to consider in the acquisition process. (5 Marks)

b) Write a simple OpenGL program for rendering on a black background and red square. (5 marks)

c) Outline different three different techniques that are used to achieve realistic rendering (5 marks)

Question Six (15 marks)

a) Principles of animation are key, discuss any 2 principles. (4 Marks)

b) Suppose you are given a scene to render through the graphics pipeline. Analyze Cartesian reference frames and procedure you would use to construct and display the scene. (6 marks)

c) Swimming" is a potential problem with projected textures. This is an effect where it looks like the animated object is moving or 'swimming' through the texture. What can be done to fix this? (5 Marks)

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