



UNIVERSITY EXAMINATIONS: 2025/2026
EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN
INFORMATION TECHNOLOGY
BBIT /BSIT 400
COMPUTER GRAPHICS AND ANIMATION
END TERM EXAMINATION

DATE: DATE: 11.00-2.00PM, FRIDAY, DECEMBER, 2025 TIME: 3 HOURS

INSTRUCTIONS: Question One is Compulsory, Choose Three Other Questions

SECTION A (COMPULSORY)

QUESTION ONE (15 Marks)

- a) Differentiate between computer graphics and image processing. (2 marks)
- b) Describe the terms persistence and resolution in reference to CRT. (2 marks)
- c) Explain any two devices used in computer animation. (2 marks)
- d) Define the following: (2 marks)
 - i) Point Clipping
 - ii) Line clipping
- e) Discuss the RGB concept, in representing images on a 3-D screen. (2 marks)
- f) Explain how animators create the "illusion of movement" (5 marks)

SECTION B

(ANSWER ANY THREE (3) QUESTIONS IN THIS SECTION)

QUESTION TWO (15 Marks)

- a) Explain Cel Animation as used in graphics animation (2 marks)
- b) Explain using illustrations and diagrams the following animation concepts:
 - i) Key framing. (2 marks)
 - ii) Interpolation. (2 marks)
 - iii) Kinematics (Forward and Inverse). (2 marks)
 - iv) Motion Capture. (2 marks)
- c) Discuss two advantages of introducing dynamics into an animation control (3 marks)

QUESTION THREE (15 Marks)

- a) Explain the concept of ray tracing and how it can be applied in rendering 3-D scenes (3 marks)
- b) One principle of traditional animation is called "squash and stretch." Name and explain two more principles. (3 marks)
- c) Consider a horizontal row of fragments that form part of a triangle during rasterization. Suppose the coordinates, normal and texture coordinates of the first and last fragment in the row have already been calculated. Describe how fragments as we scan along (5

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

- d) Discuss the process of Animation (4 marks)

QUESTION FOUR (15 marks)

- a) Define the term Morphing with an example (2 marks)
- b) Explain two important applications of computer animation. (4 marks)
- c) Describe a problem with using linear interpolation between key frames. (4 marks)
- d) Given that a ball is falling from a height $h=100$ generate the animation sequence corresponding to the motion of this ball. Equation of motion is given as: $y = h - 0.5g t^2$. Plot a simple graph to show the path taken by this ball. (5 marks)

QUESTION FIVE (15 marks)

- a) Define aliasing and describe a way to ease the aliasing problem in texture

mapping. (4 marks)

b) Discuss the two options for texture sampling in OpenGL. Contrast these options in terms of their rendering outputs and computation times. (5 marks)

c) Consider a horizontal row of fragments that form part of a triangle during rasterization. Suppose the coordinates, normal and texture coordinates of the first and last fragment in the row have already been calculated. Describe how quickly to calculate the coordinates of the other fragments as we scan along the row from the first fragment to the last fragment.

(6 marks)

QUESTION SIX (15 marks)

a) In transformations rotate by 90 degree clockwise an object with the following endpoints (2,2) (3,4) (4,2) (4 Marks)

b) Consider three different raster systems with resolutions of 540 x 380, 1080 x 924 and

1560 x 1048. What size is frame buffer (in bytes) for each of these systems to store

12 bits per pixel? (5 marks)

c) You are the technical lead for a new project. You must choose the primary animation technique for:

Project A: A realistic, narrative-driven game with highly scripted character performances.

Project B: A vast, open-world game where thousands of creatures and foliage need to move naturally in the wind.

Justify your choice of animation technique (e.g., keyframe, motion capture, procedural, physics-based) for each project, explaining the advantages and trade-offs. (6 marks)