



UNIVERSITY EXAMINATIONS

SECOND SEMESTER 2023/2024 ACADEMIC YEAR

**THIRD YEAR EXAMINATION FOR THE DEGREE OF
BACHELOR OF SCIENCE (ICT)**

COMP 321: COMPUTER GRAPHICS

STREAM: R

TIME: 2 HRS

DAY: FRIDAY [8.30 – 10.30 A.M]

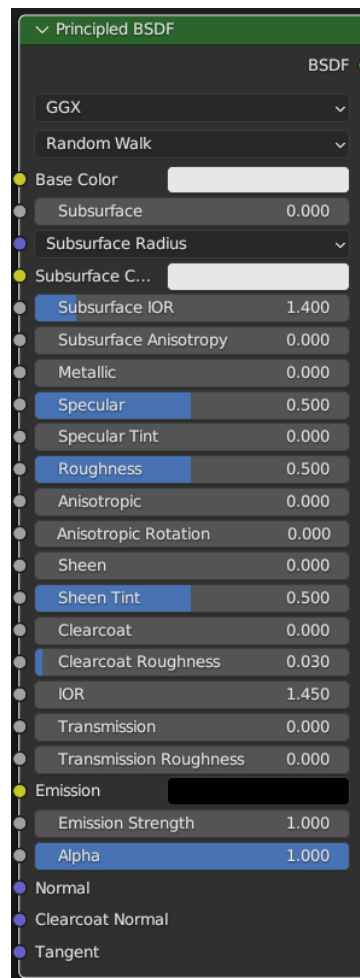
DATE: 12/04/2024

THIS QUESTION PAPER CONSISTS OF FOUR (4) PAGES

PLEASE DO NOT OPEN UNTIL THE INVIGILATOR SAYS SO.

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS**QUESTION ONE (30 MARKS)**

- Explain the significance of computer graphics in modern applications. **(2 marks)**
- Explain the concept of image representation and its importance in computer graphics. **(6 marks)**
- Define the key components of 3D graphics pipeline and their roles in rendering. **8 marks)**
- Analyze the emerging technologies virtual reality (VR) and augmented reality (AR) and how they would influence businesses in the future. **(4 marks)**
- Evaluate the principles behind ray tracing and its advantages over other rendering techniques. **(6 marks)**



- From the image above, explain the necessary properties that would be required to
 - Apply shading to a mesh **(1 mark)**
 - Apply a dielectric look to a mesh **(1 mark)**

- iii. Make the mesh fully transparent (1 mark)
- iv. Change the value of refraction for a transparent mesh (1 mark)

QUESTION TWO (20 MARKS)

- a. Compare and contrast the applications of computer graphics in different industries. (2 marks)
- b. What are the essential hardware components required for computer graphics processing? (4 marks)
- c. Describe the role of software components in computer graphics systems. (3 marks)
- d. Outline the stages of the graphics pipeline and their significance in rendering. (5 marks)
- e. Give the graphic libraries OpenGL and DirectX, justify when to use one over the other? (6 marks)

QUESTION THREE (20 MARKS)

- a. Compare and contrast RGB, CMYK, HSV, and HSL color models, highlighting their applications. (8 marks)
- b. Consider a digital image with color information provide, evaluate how grayscale conversion algorithms would transform a color image into a grayscale image? (4 marks)
- c. Discuss the benefits of histogram equalization in image processing. (3 marks)
- d. In your opinion, is it necessary to have image smoothing (blurring) in Computer Graphics. Justify your answer. (5 marks)

QUESTION FOUR (20 MARKS)

- a. Discuss the importance of coordinate systems in representing 3D objects. (2 marks)
- b. Consider a 3D object defined in an application like Blender/Maya, what geometric transformations are possible. Use a diagram to illustrate. (4 marks)
- c. How do viewing and projection techniques contribute to creating 3D scenes? (3 marks)
- d. Analyze different lighting models used in 3D graphics and their effects on rendering. (3 marks)
- e. Discuss the role of texturing and mapping in adding realism to 3D scenes. (4 marks)
- f. Compare and contrast various rendering techniques used in 3D graphics. (4 marks)



QUESTION FIVE (20 MARKS)

- a. Evaluate the process of key framing and interpolation in animation. Why are these techniques necessary? **(4 marks)**
- b. Analyze skeletal animation, and how does it facilitate character animation? **(4 marks)**
- c. Critically evaluate the concept of morphing and its applications in animation. **(3 marks)**
- d. Discuss the implementation and use cases of particle systems in computer graphics. **(2 marks)**
- e. How do physics-based animation techniques simulate realistic motion in virtual environments? Are there any factors to consider while using them? **(4 marks)**
- f. Evaluate the rendering process for animations and its challenges. **(3 marks)**

