CBCS SCHEME

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17CS62

Sixth Semester B.E. Degree Examination, Jan./Feb. 2023
Computer Graphics and Visualization

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define Computer Graphics. Describe any five applications of Computer Graphics. **(06 Marks)**

b. Explain how 2D world coordinate reference frame can be specified using OpenGL functions. **(04 Marks)**

c. Summarize Bresenham's line drawing algorithm. Why it is preferred over DDA line drawing algorithm. Digitize the line with end points (1, 2) and (7, 5) using Bresenham's line drawing algorithm and depict the same with a neat algorithm. **(10 Marks)**

OR

2 a. Explain point function, line function and line attributes functions. **(06 Marks)**

b. Differentiate between Raster scan display and Random scan display. **(04 Marks)**

c. Summarize circle generation algorithm (Bresenham's). Determine pixel positions along the circle octant in first quadrant given radius = 2 and center = (2, 2) using the same algorithm. **(10 Marks)**

Module-2

3 a. How polygons are classified? To which type of polygon OpenGL fill area routines can be applied? Explain two commonly used algorithms used to identify interior region of a polygon. **(10 Marks)**

b. Define shearing. A polygon has coordinate positions (0, 0), (0, 1), (1, 1) and (1, 0), if parameter Shy = 0.5 and shearing reference $x_{ref} = -1$, determine coordinates of the polygon after shearing. Draw original and sheared polygon. **(06 Marks)**

c. Explain any two OpenGL polygon fill area functios. **(04 Marks)**

OR

4 a. Define Geometric transformations. Explain basic 2D translation. Rotate a polygon which has coordinate positions (1, 1), (3, 1) and (2, 3) by 90° (Counterclockwise) about a fixed point (2, 2). Determine coordinates after rotation. Draw original and rotated polygon [Take cos 90 = 0, sin 90 = 1]. **(10 Marks)**

b. Explain general scan line polygon fill area algorithm. **(06 Marks)**

c. What is significance of homogeneous coordinates? Write inverse transformation metrics for basic 2D transformations. **(04 Marks)**

Module-3

5 a. Specify all the possible region codes that are considered in Cohen Sutherland line clipping algorithm. A rectangular clipping window has coordinates for left corner and top right corner (2, 3) and (6, 6) respectively. Using this window clip the line which has end coordinates (1, 2) and (4, 7) and determine end coordinates of the line after clipping. **(08 Marks)**

b. Explain how a point in a world coordinate clipping window can be mapped to its relative position in normalized view port. **(08 Marks)**

c. Define : (i) Diffuse reflection (ii) Specular reflection
(iii) Ambient light (iv) Lambertian reflector **(04 Marks)**

OR

6 a. Explain Sutherland Hodgman polygon clipping algorithm. Clip the given below triangle using Sutherland Hodgman polygon clipping algorithm. [Refer Fig.Q6(a)]

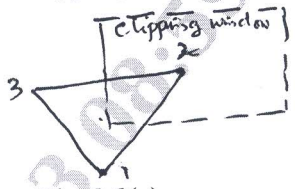

Fig.Q6(a) **(10 Marks)**

b. Construct a 3D scaling transformation matrix with respect to fixed point. **(06 Marks)**

c. Explain RGB and CMR color model. **(04 Marks)**

Module-4

7 a. Explain 3D viewing pipeline with a neat diagram. **(05 Marks)**

b. Construct transformation matrix to transform world coordinates to viewing coordinates. Give necessary explanation. **(05 Marks)**

c. Define parallel project. Explain orthogonal projection view volume and mapping of orthogonal projection view volume to normalized view volume. **(10 Marks)**

OR

8 a. Define and explain Perspective projection. Discuss special cases. **(10 Marks)**

b. Explain Depth buffer algorithm. **(06 Marks)**

c. What is depth using? Explain polygon culling function. **(04 Marks)**

Module-5

9 a. What are the characteristics of input device that describe logical behavior of input device? Explain six classes of logical input devices. **(08 Marks)**

b. Explain how event driven input can be performed for a key board and mouse, with the help of suitable code snippet. **(08 Marks)**

c. Why double buffering is used. How it is implemented using OpenGL functions. **(04 Marks)**

OR

10 a. What are the entities in terms of which input device provides input to application program. Explain different modes of input. **(10 Marks)**

b. Explain Logic Operations (Graphics). **(04 Marks)**

c. Write a note on :

i) Features of interactive program

ii) Spherical surface

iii) Properties of Bezier curve **(06 Marks)**

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