

AMIETE – CS/IT (New Scheme)

Time: 3 Hours

DECEMBER 2016

Max. Marks: 100

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

Q.1 Choose the correct or the best alternative in the following. (2×10)

- a. The number of pixels stored in the frame buffer of a graphics system is known as
- (A) Resolution (B) Depth
(C) Intensity (D) Saturation
- b. The process of digitizing a given picture definition into a set of pixel-intensity for storage in the frame buffer is called
- (A) Rasterization (B) Encoding
(C) Scan conversion (D) True color system
- c. Aspect ratio means
- (A) Number of pixels
(B) The ratio of the width to the height of an image
(C) Ratio of black pixel count to white pixel count
(D) Both (A) and (C)
- d. Which of the following hidden surface algorithms does not employ image space approach:
- (A) back face removal (B) depth buffer method
(C) scan line method (D) depth sort method
- e. A pixel of gray-scale image take space in memory equal to
- (A) 1 bit (B) 1 byte
(C) 1 nibble (D) 3 bytes

- f. What will be the visual effect on the object when the transformation matrix is like below:

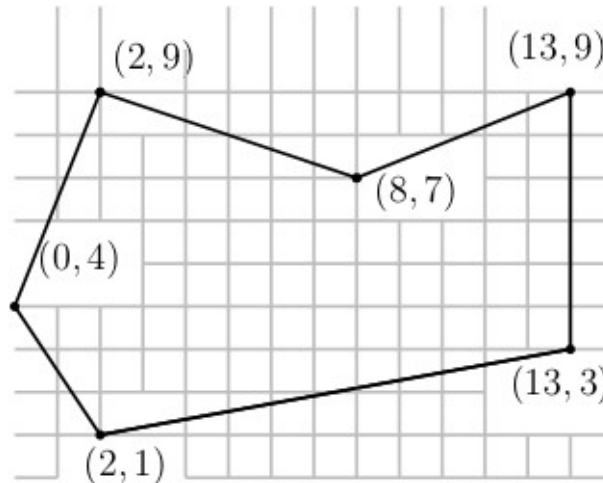
$$\begin{matrix} 0 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{matrix}$$
 (A) The object is transformed to a line parallel to y-axis
 (B) The object is transformed to a line parallel to x-axis
 (C) The object is transformed to a line parallel to $y=x$
 (D) No change takes place
- g. The point at which a set of projected parallel lines appear to converge is called as :
 (A) convergence point (B) vanishing point
 (C) point of illusion (D) None of these
- h. Plane parameters for a plane are A, B, C and D. Any point (x,y,z) is behind the plane if
 (A) $Ax+By+Cz+D > 0$ (B) $Ax+By+Cz+D < 0$
 (C) $Ax+By+Cz+D = 0$ (D) $Ax+By+Cz+D \neq 0$
- i. Normal to the line AB, where A= (10,0) and B= (10,10) is given by :
 (A) (-1, 0) (B) (1, 1)
 (C) (0, 1) (D) (-1,-1)
- j. For region filling if *flood-fill* procedure is replaced by *scan-line* filling then :
 (A) Stack operation increases
 (B) Stack operation decreases
 (C) No difference in the context of stack operation
 (D) None of these.

Answer any FIVE Questions out of EIGHT Questions.

Each question carries 16 marks.

- Q.2** a. Show that in 2D, reflection about the line $x=y$ can be implemented using a reflection relative to x-axis followed by a rotation of 90° counter clockwise. (8)
- b. Prove that multiplication of transformation matrices for each of the following sequence of operation is commutative: i) two successive rotations
 ii) two successive translations. (8)
- Q.3** a. Write the Bresenham's line drawing algorithm for lines with positive slopes less than 1. Also show the genesis of the algorithm. (10)
- b. Show the first seven points / pixels for the line segment (0,1) to (8,3) using the Bresenham's line drawing algorithm. (6)
- Q.4** a. What do you understand by the Image Processing? In which manner Image Processing is different from Computer Graphics? (6)
- b. Define Computer Graphics. Describe the role of Computer Graphics in (4+3+3)
 (i) Computer-Aided Design (CAD)
 (ii) Virtual-Reality Environments
 (iii) Data Visualizations

- Q.5** a. A rectangular window is described by bottom left corner at (-3,1) and top right corner at (2,6). Apply the Sutherland – Cohen method to clip the line AB with A(-4, 2) and B(-1,7) by the window. (8)
- b. Write the Sutherland-Hodgman polygon clipping algorithm. (8)
- Q.6** a. Write down the flood-fill algorithm for region filling. (6)
- b. Demonstrate the scanline filling algorithm using edge tables for the hexagon given below. (10)



- Q.7** a. Why visible surface detection is needed? Show how surface normals can be used for visible surface detection. (6)
- b. (i) What is ray tracing?
(ii) Derive the equations to report the intersection points of a ray with a given sphere.
(iii) For visible surface detection, can the ray tracing method handle transparent surfaces? How? (2+4+4)
- Q.8** a. Write the functions in an OpenGL, for the followings: (4+3+3)
(i) To specify a procedure that is to be invoked when a key is pressed by a Keyboard
(ii) To obtain an input from a button box
(iii) To record a dial rotation
- b. How can we overcome the limitations for device-independent graphics packages, where only a limited set of input functions can be provided in an auxiliary library? (6)
- Q.9** a. Define Computer Animation. What are the methods for constructing a motion-sequence in animation? (8)
- b. What is the basic approach to design an animation sequence which involves a story lines and multiple objects? (8)