Code: AC111/AT111   **Subject: Computer Graphics & Visualization**

AMIETE – CS/IT (New Scheme)

Time: 3 Hours   **June 2018**   **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. Sutherland Hodgeman algorithm works well for
- **(A)** Concave polygon
- **(B)** Convex polygon
- **(C)** Smooth curves
- **(D)** Line segment

b. Display card is used for the purpose of
- **(A)** Sending graphics data to input unit
- **(B)** Sending graphics data to output unit
- **(C)** Receiving graphics data from output unit
- **(D)** None of these

c. Coordinates of window are knows as
- **(A)** Screen coordinates
- **(B)** Device coordinates
- **(C)** World coordinates
- **(D)** Cartesian coordinates

d. A major disadvantage of DVST in interactive computer graphics is
- **(A)** Ability to selectively erase part of an image
- **(B)** Inability to selectively erase part of image
- **(C)** Inability to produce bright picture
- **(D)** None

e. If a point (x,y) is reflected about an axis which is normal to the XY plane and passing through the origin, the reflected point (X,Y) is :
- **(A)** (x,-y)
- **(B)** (-x,y)
- **(C)** (-x,-y)
- **(D)** (y,x)

f. Why we need removal of hidden surface?
- **(A)** for displaying realistic view
- **(B)** for determining the closest visible surface
- **(C)** Both **(A)** & **(B)**
- **(D)** None of these

g. Graphics and image processing technique used to produce a transformation of one object into another is called
    (A) Animation   **(B)** Morphing
    (C) Half toning   **(D)** None of these

h. The painter algorithm are based on the property of
    (A) Frame buffer   **(B)** Polygon
    (C) Depth buffer   **(D)** None of these

i. Beam penetration method is usually used in
    (A) LCD   **(B)** Raster Scan display
    (C) Random scan display   **(D)** DVST

j. To specify the animation paths between the key frames, a popularly and frequently used technique is :
    (A) Transformation   **(B)** Triangulation method
    (C) Linear Regression   **(D)** Curve fitting

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a. Write down the difference between Raster Scan and Random Scan display systems. Discuss the Raster Scan System with refresh operation and display processor with neat diagram.   **(8)**

b. What is the fraction of the total refresh time per frame spent in retrace of the electron beam for a non- interlaced raster system with a resolution of 1280 by 1024, a refresh rate of 60 Hz, a horizontal retrace time of 5 microseconds, and a vertical retrace time of 500 microseconds?   **(8)**

Q.3 a. Distinguish between Emissive and Non-Emissive display devices.   **(4)**

b. Describe clearly the functioning of different types of Touch Panels.   **(6)**

c. With the help of neat and clear diagrams describe the functioning of LEDs and LCDs.   **(6)**

Q.4 a. Explain the Boundary fill and Flood fill algorithm with example.   **(8)**

b. Explain OpenGL Polygon Fill-Area and OpenGL Character attribute function. **(8)**

Q.5   a. Prove that a uniform scaling ($S_x = S_y$) and a rotation form a commutative pair of operations but, in general, scaling and rotation are not commutative operations. **(8)**

     b. What is homogeneous coordinates? What are their advantages? Prove that if rotation angle is θ, the transformation matrix formed when multiplied by the transformation matrix formed by replacing θ with $-\theta$ is equal to identity matrix. **(8)**

Q.6   a. Explain the Sutherland–Hodgeman Polygon Clipping algorithm with the help of suitable figures. **(8)**

     b. Explain window to view port Transformation.
Find the normalization transformation that maps a window whose lower left corner is at (1,1) and upper right corner is at (3,5) on a view port that has lower left corner at (0,0) and upper right corner at (1/2,1/2). **(4+4)**

Q.7   a. Discuss the Z-Buffer Algorithm and show the equations that derives the z-values. Support your explanation with suitable figures. **(8)**

     b. Discuss the equations that describe Gouraud Shading. Explain how is Phong Shading more accurate method of surface rendering? **(8)**

Q.8   a. Explain briefly each of the Interactive Picture-Construction Techniques. Support your explanation with figures. **(8)**

     b. List the different input and output components that are typically used with Virtual Reality Systems. Also explain how users interact with a virtual scene displayed with different output devices, such as two-dimensional and stereoscopic monitors. **(8)**

Q.9   a. Explain the steps involved in the designing of Animation Sequences. **(8)**
     b. Write Short Notes on
       (i) Key Frame Systems
       (ii) Articulated Figure Animation **(4+4)**