Code: AC60/AT60   **Subject: COMPUTER GRAPHICS**

AMIETE – CS/IT (Current Scheme)

Time: 3 Hours | DECEMBER 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. In Bresenham's algorithm, while generating a circle, it is easy to generate
   - **(A)** One octant first and other by successive reflection
   - **(B)** One octant first and other by successive rotation
   - **(C)** One octant first and other by successive translation
   - **(D)** All octants

   b. The property that adjacent pixels are likely to have the same characteristics is called
   - **(A)** spatial coherence   **(B)** area coherence
   - **(C)** scan line coherence   **(D)** pixel coherence

   c. Refresh rate is
   - **(A)** The rate at which the number of bit planes are accessed at a given time
   - **(B)** The rate at which the picture is redrawn
   - **(C)** The frequency at which the aliasing takes place
   - **(D)** The frequency at which the contents of the frame buffer is sent to the display monitor

   d. Which of the following technique is used in Midpoint Subdivision algorithm ?
   - **(A)** Linear search   **(B)** Binary search
   - **(C)** Heap sort   **(D)** Bubble sort

   e. A line with endpoint codes as 0000 and 0100 in Cohen-Sutherland line clipping algorithm is
   - **(A)** Partially invisible   **(B)** Completely visible
   - **(C)** Completely invisible   **(D)** Trivially invisible

   f. All the hidden surface algorithms employ image space approach except
   - **(A)** Back face removal   **(B)** Depth buffer method
   - **(C)** Scan line method   **(D)** Depth sort method

g. A cube of side 1 unit is placed such that the origin coincides with one of its vertices and the three axes run along three of its edges. The vertex diagonally opposite to (0,1,0) is
   (A) (0,0,0)   **(B)** (1,1,0)
   (C) (0,0,1)   **(D)** (0,1,1)

h. Two curves are said to be connected at a point with second order connectivity if
   (A) both curves simply meet at that point
   (B) the tangents to both the curves at that point are equal
   (C) the curvatures of both the curves at that point are equal
   (D) there is a discontinuity for both the curves at that point

i. Reflection of a point x-axis, followed by a counter clock-wise rotation of 90^0, is equivalent to reflection about the line :
   (A) x = -y   **(B)** y = x
   (C) x = y   **(D)** x + y = 1

j. Z-buffer algorithm is used for
   (A) frame buffer removal   **(B)** hidden line removal
   (C) surface rendering   **(D)** convex polygons

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

Q.2.   a. What is a Frame Buffer? Explain the task of a Display Controller.   **(4)**

   b   If we want to resize a 1024 x 768 image to one that is 640 pixels wide with the same Aspect Ratio, what would be the height of the resized image?   **(4)**

   c. Describe working mechanism of the following devices:
      (i) Keyboard   (ii) Laser Printer   **(8)**

Q.3   a. Give the Open GL code for drawing the dot plot of a function.   **(8)**

   b. Define the terms window & Viewport. Find the normalization transformation that maps a window whose lower left corner is at (1,1) and upper right corner is at (3, 5) onto
    (i) Viewport that is the entire normalized device screen.   **(8)**
    (ii) Viewport that has lower left corner at (0, 0) and upper right corner at (½, ½)

Q4.   a.   Explain the Polygon Clipping algorithm given by sutherland hodgman .   **(8)**

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b. Give the pseudocode of Cyrus-Beck algorithm for Line Clipping.   **(8)**

Q.5   a. Derive the transformation equations for scaling an object in arbitrary directions. **(8)**

b. Write an OpenGL code that draws a triangle with vertices A(100, 100), B(150,100)
and C(125, 50). Explain the purpose of any four functions used in OpenGL.   **(8)**

Q.6   a. How are Polygon Mesh represented? Discuss the properties of meshes.   **(8)**

b. Derive the transformation equations and the corresponding homogeneous matrix
representation for Oblique Projection.   **(8)**

Q.7   a. Define tilting as rotation about the x-axis followed by rotation about the y-axis. **(8)**
(i) Find the tilting matrix   (ii) does the order of performing the rotations matter?
Justify.

b. Magnify a triangle with vertices A(0,0), B(1,1) and C(5,2) to twice its size, while
keeping C(5,2) fixed.   **(8)**

Q.8   a. Discuss the Z-buffer algorithm with a suitable figure. Also write the algorithm
showing how the depth values are determined mathematically.   **(8)**

b.   What is Phong Shading? Show the limitations with Gouraud Shading. Which
shading method can be used to overcome these limitations and how?   **(8)**

Q.9   a.   Discuss the concept behind Curve design throwing light on Blending functions as
well.   **(8)**

b.   Give the various applications of Bezier Curves also explain its properties with
suitable figures.   **(8)**