

## B2.53-R3: COMPUTER GRAPHICS

### NOTE:

1. There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions.
2. **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book.
3. Maximum time allotted for **PART ONE** is **ONE HOUR**. Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned. However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**.

**TOTAL TIME: 3 HOURS**

**TOTAL MARKS: 100**  
**(PART ONE – 40; PART TWO – 60)**

### **PART ONE** **(Answer all the questions)**

1. **Each question below gives a multiple choice of answers. Choose the most appropriate one and enter in the “tear-off” answer sheet attached to the question paper, following instructions therein. (1 x 10)**
  - 1.1 If a 1024 x 768 image is to be resized to one that is 640 pixels wide with the same aspect ratio, what would be the height of resized image in pixels.
    - A) 256
    - B) 480
    - C) 512
    - D) 856
  - 1.2 Which format is used to store digital audio in multimedia application?
    - A) GIF
    - B) WAV
    - C) JPEG
    - D) BMP
  - 1.3 Which method is also known as Painter’s algorithm?
    - A) Scan Line
    - B) BSP-Tree
    - C) Depth-Sorting
    - D) Area-Subdivision
  - 1.4 For which type of display the beam-penetration method has not been used?
    - A) Calligraphic Display
    - B) Random-scan Display
    - C) Raster-scan Display
    - D) Stroke-Writing Display
  - 1.5 A phosphor with low persistence is useful for
    - A) Animation
    - B) Image Processing
    - C) CAD method
    - D) Presentation

- 1.6 An orthographic projection is a
- A) Perspective projection
  - B) Parallel projection
  - C) Projection on a curved surface
  - D) None of the above
- 1.7 Which of the following color model is useful for describing color output to hardcopy device such as plotter?
- A) RGB color model
  - B) YIQ color model
  - C) CMY color model
  - D) HSV color model
- 1.8 Which Line Clipping algorithm performs fewer comparison and division operations to clip a line?
- A) Nicholl-Lee-Nicholl line clipping algorithm
  - B) Cohen-Sutherland line clipping algorithm
  - C) Liang-Barsky line clipping algorithm
  - D) Cyrus-Beck line clipping algorithm
- 1.9 The graphics tablet belongs to which type of input device?
- A) Stroke
  - B) String
  - C) Valuator
  - D) Pick
- 1.10 "If the position of any one control point is altered the entire curve is affected." This statement is true for
- A) Natural Cubic Splines
  - B) Kocknek-Bartels Splines
  - C) Beta-Splines
  - D) Rational Splines

2. Each statement below is either TRUE or FALSE. Choose the most appropriate one and ENTER in the “tear-off” sheet attached to the question paper, following instructions therein. (1 x 10)

- 2.1 Convex polygons are correctly clipped by the Weiler-Atherton polygon clipping algorithm, but concave polygon may be clipped with extraneous lines.
- 2.2 The MIDI files are much more compact than digital audio files.
- 2.3 For Cubic Bezier curves, only four blending function can be obtained.
- 2.4 Space-partitioning representation describes a three-dimensional object as a set of surfaces.
- 2.5 The maximum number of points that can be displayed without overlap on a CRT is referred as the aspect ratio.
- 2.6 The multiplication of transformation matrices for two successive scaling operations is commutative.
- 2.7 Objects with curved boundaries are processed against rectangular clipping windows by calculating intersections using the line equation.
- 2.8 Constants shading can produce good result for dull polyhedrons lit by light sources that are relatively far away.
- 2.9 A commonly used image-space approach to detecting visible surface is the depth-buffer method which compares surface depths at each pixel position on the projection plane.
- 2.10 Back face removal method is applicable for curved surface.

3. Match words and phrases in column X with the closest related meaning/ word(s)/phrase(s) in column Y. Enter your selection in the “tear-off” answer sheet attached to the question paper, following instructions therein. (1 x 10)

| X    |   | Y  |                        |
|------|---|----|------------------------|
| 3.1  | Object-motion characteristics to be specified as part of the object definition in   | A. | Scaling                |
| 3.2  | A common device for drawing, painting or interactively selecting coordinates position on object is  | B. | An image file          |
| 3.3  | A transformation that distorts the shape of an object such that the transformed shape appears as if the object were composed of internal layer is | C. | Refresh display file   |
| 3.4  | To apply image-processing methods, we first digitize a picture into   | D. | Line clipping          |
| 3.5  | In random display, picture definition is stored as a set of line drawing commands in an area of memory referred to as the                         | E. | Data glow              |
| 3.6  | The midpoint subdivision algorithm is used for  | F. | Parameterised System   |
| 3.7  | Dragging in computer graphics can be achieved through   | G. | Digitizers             |
| 3.8  | The creation and manipulation of a system representation is termed as   | H. | Window transformation  |
| 3.9  | The mapping of a part of a world-coordinate scene to device coordinate is referred as   | I. | Translation            |
| 3.10 | Super Sampling is also known as   | J. | Key-Frame System       |
|      |   | K. | Shearing               |
|      |   | L. | Viewing transformation |
|      |   | M. | Pixel phasing          |
|      |   | N. | Post filtering         |
|      |   | O. | Modelling              |

4. Each statement below has a blank space to fit one of the word(s) or phrase(s) in the list below. Enter your choice in the “tear-off” answer sheet attached to the question paper, following instructions therein. (1 x 10)

|           |                        |           |                        |           |                   |
|-----------|------------------------|-----------|------------------------|-----------|-------------------|
| <b>A.</b> | B-splines              | <b>B.</b> | Aliasing               | <b>C.</b> | Wire frame        |
| <b>D.</b> | AVI                    | <b>E.</b> | Bezier curve           | <b>F.</b> | Seed              |
| <b>G.</b> | Color                  | <b>H.</b> | CRT                    | <b>I.</b> | WAV               |
| <b>J.</b> | Viewing-coordinate     | <b>K.</b> | Perspective Projection | <b>L.</b> | Tweeking          |
| <b>M.</b> | Parallel Projection    | <b>N.</b> | Emissive display       | <b>O.</b> | Presentation      |
| <b>P.</b> | Homogeneous coordinate | <b>Q.</b> | Animation              | <b>R.</b> | Polar Coordinates |

- 4.1 To obtain \_\_\_\_\_ of a three-dimensional object, we transform points along projection lines that meet at the projection reference point.
- 4.2 \_\_\_\_\_ files are used to store audio and video data.
- 4.3 The \_\_\_\_\_ is a technique for building progressive images and running it in a sequence to give the effect of motion.
- 4.4 To express two-dimensional transformation as 3x3 matrix, we represent each Cartesian coordinate position with the \_\_\_\_\_.
- 4.5 To obtain a particular orientation for the window, we can set up a two-dimensional \_\_\_\_\_ system, in the world coordinate plane and define a window in it.
- 4.6 Uniform \_\_\_\_\_ have periodic blending function.
- 4.7 The \_\_\_\_\_ are devices that convert electrical energy into light.
- 4.8 In a rasterized line the phenomenon known as \_\_\_\_\_ is responsible for jagged edges or stair case effect.
- 4.9 The flood fill algorithm begins with a \_\_\_\_\_ pixel in the interior of the regions and floods the region with the new color.
- 4.10 Three-dimensional solid objects can be displayed in two ways namely as \_\_\_\_\_ models and solid models.

**PART TWO**  
(Answer any **FOUR** questions)

- 5.**
- a) What are the advantages and disadvantages of DDA line drawing algorithm?
  - b) Write down the properties of Bezier curve giving their usefulness.
  - c) Write down the steps of midpoint circle generation algorithm.
- (2+5+8)**
- 6.**
- a) When a 3D object is to be rotated about any axis that is parallel to x-axis, we need to perform some additional transformation. Derive the 3D rotation transformation matrix for rotation of an object about x-axis.
  - b) What is an OpenGL? Explain architecture of OpenGL. What are the features of graphics library?
- (10+5)**
- 7.**
- a) One way to fill an area is to determine the overlap intervals for scan lines that cross the area. What are the steps involved for filling a polygon using the scan line fill algorithm?
  - b) Any procedure that identifies those portions of a picture which are either inside or outside of a special region of a space is referred as a clipping algorithm. Describe Cohen-Sutherland Line Clipping method.
- (10+5)**
- 8.**
- a) Perform a 45° rotation of triangle A(0, 0), B(1, 1), C(5, 2)
    - i) about the origin and
    - ii) about point P(-1, -1)
  - b) What are the various application areas of computer graphics?
  - c) A general purpose language is often used to program the animation functions, but several specialized animation languages have been developed. Give the names of these languages and explain in brief.
- (8+4+3)**
- 9.** Answer any **three** in brief:
- a) Name the available method for inside-outside test of point for polygon. Explain those methods.
  - b) Write steps of Z buffer algorithm.
  - c) Explain the different methods for producing color display with a CRT.
  - d) Explain Direct View Storage Tube input device.
- (3x5)**