No. of Printed Pages : 3

MMTE-004

M.Sc. (MATHEMATICS WITH APPLICATIONS IN COMPUTER SCIENCE)

M.Sc. (MACS)

00362

Term-End Examination

December, 2018

MMTE-004 : COMPUTER GRAPHICS

Time : $1\frac{1}{2}$ hours *Maximum Marks : 25*

(Weightage : 50%)

Note : *Question no. 1 is **compulsory**. Attempt any **three** questions out of questions no. 2 to 5. Use of calculator is **not** allowed.*

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1. State whether the following statements are *True* or *False*. Justify your answers. *5×2=10*

(a) The height of the resized image 1024×768 to one that is 640 pixels wide with the same aspect ratio is 480.

(b) The anti-aliasing technique which allows shift of $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ of a pixel diameter enabling a closer path of a line is Pixel phasing.

(c) Frame buffer is the device which controls the refresh rate.

(d) Uniform scaling and rotation form a commutative pair of operations.

(e) The projection matrix

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & -\frac{5}{3} & -\frac{8}{3} \\ 0 & 0 & -1 & 0 \end{bmatrix}$$

represents a parallel projection on xy plane.

2. (a) Differentiate between oblique and orthogonal projections. *2*

(b) Plot a circle at (5, 5) having a radius of 5 units using mid-point circle algorithm. *3*

3. (a) Find the transformation matrix that reduces the square ABCD, whose centre is at (2, 2), to half of its size, with centre still remaining at (2, 2). The coordinates of the square ABCD are A(0, 0), B(0, 4), C(4, 4) and D(4, 0). Find the coordinates of the new square. *3*

(b) Write the output obtained after executing the following statements : 2

```
glColor3f (1, 1, 1)
glColor3f (0, 1, 0)
glVertex3f (1, 1, 1)
glColor3f (1, 0, 0)
glVertex3f (2, 2, 2)
```

4. Find the equation of the Bezier curve which passes through the points (0, 0) and (– 2, 1) and is controlled through points (7, 5) and (2, 0). 5

5. Let R be the rectangular window whose lower left hand corner is at (– 4, 1) and upper right hand corner is at (3, 6). Find the region code for the following segments and state whether they are partially visible, fully visible or invisible :

(a) A(– 5, 2) to B(– 1, 7)

(b) C(– 2, 3) to D(1, 2)

(c) E(– 5, 7) to F(– 2, 10)

Further apply the Cohen–Sutherland algorithm to clip these line segments. 5