

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

M.Sc. (MACS)

Term-End Examination

June, 2016

00785

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.

1. State whether the following statements are *true* or *false*. Justify your answers. $5 \times 2 = 10$
- (a) The resolution of size 2×2 inch image having 512×512 pixels is 256. If the size is increased to 4×4 inches, then the resolution becomes double.
 - (b) The reflection about the line $y = x$ is attained by reversing x, y coordinates.
 - (c) Uniform scaling and rotation form a commutative pair of operations.

- (d) The perspective projection onto the view plane $z = d$, where the centre of the projection is the origin $(0, 0, 0)$ is

$$\begin{pmatrix} d & 0 & 0 & 0 \\ 0 & d & 0 & 0 \\ 0 & 0 & d & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}$$

- (e) If the spacing between the knot sequence of a cubic spline curve is uniformly doubled, then the shape of the resulting B-spline curve changes.

2. (a) A picture has a resolution of 1024×1280 with each of the three colours being represented by 8-bit planes each. What is the storage requirement in megabytes for a 20 second animation of the above picture with 30 frames per second ? If the compression ratio is 5 : 1, what is the storage requirement ?

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- (b) What is the role of a video controller ?

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3. Consider a polygon with vertices $V_1(2, 4)$, $V_2(9, 4)$, $V_3(9, 7)$, $V_4(8, 7)$, $V_5(8, 9)$, $V_6(4, 9)$, $V_7(4, 7)$, $V_8(2, 7)$, $V_9 = V_1$ and edges $E_i = V_i V_{i+1}$ for $i = 1, 2, 3, \dots, 8$. Write the initial sorted edge list for the polygon. State which edges will be active on scan lines $y = 6, 7, 8, 9, 10$.

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4. (a) Perform a 45° rotation of triangle $A(0, 0)$, $B(1, 1)$, $C(5, 2)$ about the origin. 3
- (b) Find a normalization transformation from the window whose lower left corner is at $(0, 0)$ and upper right corner is at $(4, 3)$ onto the normalized device screen so that aspect ratios are preserved. 2
5. Let W be a window whose lower left hand corner is at $(-4, 1)$ and upper right hand corner is at $(3, 6)$. Trace Cohen-Sutherland line clipping algorithm for the following line segments : 5
- (a) $A(-5, 2)$ to $B(-1, 7)$
- (b) $C(-2, 3)$ to $D(1, 2)$
- (c) $E(-5, 7)$ to $F(-2, 10)$
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