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MMTE–004

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

Term-End Examination

December, 2010

MMTE–004 : COMPUTER GRAPHICS

Time : 1½ hours *Maximum Marks : 25*

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

1. State whether the following statements are true or false. Justify your answer with the help of a short proof or a counter example or reason : **2x5=10**
   (a) The focusing system in a CRT is needed to force the electron beam to converge into a small spot as it strikes the phosphor.
   (b) Height of the resized image 1024×768 to one that is 640 pixels wide with the same aspect ratio is 500 pixels.
   (c) It takes more time to process outline fonts as compared to bitmap fonts.
   (d) A parallel projection gives a realistic representation of an appearance of a 3-D object.
   (e) If $x'y'$ coordinate system results from the xy coordinate system by scaling of a unit in x-direction and b unit in y-direction then a circle $x^2+y^2=1$ in the $x\,y$ coordinate system remains a circle in the $x'\ y'$ coordinate system.

2. (a) Explain the Cohen - Sutherland line clipping algorithm. Let w be a window having two diagonally opposite corners (2, 2) and (6, 5). Trace the Cohen - Sutherland line clipping algorithm for the line segment having end points (0, 0) and (5, 4). 3

(b) For a polygon with vertices V_0 (10, 30), V_1 (20, 10), V_2 (30, 20), V_3 (40, 0), V_4 (40, 50) prepare an initial sorted edge list and make the active edge list for scan lines $y=15, 40$. 2

3. (a) Explain the midpoint circle algorithm and demonstrate it for a circle of radius $r=15$ with centre at the origin, upto three iterations. 3

(b) Transform the scene in the world coordinate system with the view point at (3, 3, 3). The view plane normal vector is $(-1, -1, -1)$ and the view up vector is (0, 0, 1). 2

4. (a) Use the midpoint method and symmetry considerations to scan convert the parabola $y=100-x^2$ over the interval $-2 \leq x \leq 2$. 3

(b) Differentiate between passive matrix LCD and an active matrix LCD. Give at least two differences. 2

5. (a) Let $BEZ_{k,n}$ be k^{th} Bernstein polynomial defined by 3

$BEZ_{k,n}(u) = C(n, k)\, u^k (1-u)^{n-k}$ where C (n, k) are binomial coefficients given by

$C(n, k) = \frac{n!}{k!(n-k)!}$ and $BEZ_{k,n}(u) \equiv 0$ for k>n or k<0 prove that.

(i) $BEZ_{k,n}(u) = (1-u)\, BEZ_{k,n-1}(u) + u\, BEZ_{k-1,n-1}(u),\ n>k\leq 1$

(ii) $\sum_{k=0}^{n} BEZ_{k,n}(u) \equiv 1.$

(b) Locate the new position of a triangle with vertices (5, 4), (8, 3), (8, 8) after its rotation by 90° in the clockwise direction about its centroid. 2