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

## Term-End Examination,

## December 2019

## MMTE-004 : COMPUTER GRAPHICS

*Time : 1½ Hours]* *[Maximum Marks : 25*
*(Weightage: 50%)*

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*Note : (i) Question No. 1 is **Compulsory**.*
*(ii) Attempt **any three** questions out of questions No. 2 to 5.*
*(iii) Use of calculator is **not** allowed.*

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1. State whether the following statements are True or False. Justify your answers with a short proof or a counter. Example. 10
   a) The Midpoint line generation algorithm requires performing integer calculations only.
   b) A perspective projection preserves relative proportions.
   c) For finding the region of the plane in which the given line lies, a three bit binary code is used by the Cohen Sutherland line clipping algorithm.
   d) The simultaneous shearing along both the x-axis and the y-axis is equal to the composition of shear along the x-axis followed by shear along the y-axis.
   e) The reflection about the line $y = -x$ is attained by reversing the x and y coordinates.

2. a) Plot a circle at (5, 5) having a radius of 5 units using the mid-point circle drawing algorithm. Do three iterations of the algorithm. 3

   b) Magnify the triangle P(0, 0), Q(2, 2) and R(10, 4) to four times its size while keeping R(10, 4) fixed. Also write the coordinates of the magnified triangle. 2

3. a) Perform a 45° rotation of the triangle A(0, 0), B(1, 1) and C(5, 2) 3
   i) About the origin, and
   ii) About the point P(–1, –1).

   b) Give two differences between cabinet and cavalier projections. 2

4. a) For a Polygon with the vertices V0 = (10, 20), V1 = (20, 0), V2 = (30, 10), V3 = (40, 0), V4 = (40, 40), V5 = (30, 30), V6 = (20, 40) and V7 = (30, 20), prepare an initial sorted edge list and then make the active edge list for scan lines Y = 5,20, 30, 35. 3

   b) Trace the DDA algorithm for drawing a line segment from (0, 0) to (6, 6). 2

5. a) Let $P(t)$ be the Bezier curve defined over the interval [0, 1]. Prove the following: 3
   i) $P(0) = P_0$, $P(1) = P_n$;
   ii) $P'(0) = n(P_1 - P_0)$,
   $P'(1) = n(P_n - P_{n-1})$,
   Where $n$ is the degree of the Bezier curve, $P_0$, $P_1$,.....$P_n$ are its control points and P' is $\frac{dP(t)}{dt}$.

   b) Use the Liang Barsky Line clipping algorithm to clip a line segment with end points P1(–15, –30), P2 (30, 60), against a clipping window having diagonally opposite corners as (0, 0) and (15, 15). 2