JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2025

B.Tech-V Semester (CSE)

COURSE CODE (CREDITS): 18B11CI515 (3) MAX. MARKS: 35

COURSE NAME: Computer Graphics

COURSE INSTRUCTORS: ATA, PTK, SMA, AYS MAX. TIME 2 Hours

Note: *(a) All questions are compulsory.*

(b) The candidate is allowed to make Suitable numeric assumptions wherever required

for solving problems

(c) Calculator is allowed

Q.No	Question	CO	Marks
Q1	Write down the sequence of steps used to rotate any 3-D object about an arbitrary axis/line in 3-D space. Derive all the necessary equations and matrices for each and every step. Also, draw all the appropriate neat and clean diagrams to show the position of the arbitrary axis/line for every step.	4	10
Q2	A) Write down Algorithm steps for Weiler Atherton Polygon Clipping. Explain with an example. B) For an octree of full subdivision to depth d=4 (root is depth 0), what is the maximum possible number of nodes in the tree (including internal nodes and leaves)? C) Define: 1) Constructive Solid Geometry 2) Need of Solid Modeling 3) Axonometric Projections 4) Sweep Representations	2, 5	4+2+4
Q3	A) A triangle has vertices A(1,2), B(5,2), C(3,6). Rotate the entire triangle 60° clockwise about the arbitrary pivot point P (2, 3). Compute the final coordinates of all three vertices after transformation with all steps and formula. B) Using the Liang–Barsky line clipping algorithm, clip line segment joining the points P1(2,8) and P2(14,4) when clipped against a rectangular window whose opposite corners lie at (4,5) and (12,10). Compute all necessary p_k and q_k terms, update the admissible parameter interval (u1,u2).	2, 3	4+4
4.	A) If boundary fill (4-connected) is applied to a region where the	3	2+5

boundary color and fill color are identical, what computational (programmical) condition terminates the algorithm and why?

B) A graphic designer is creating a logo that consists of a large circle and a diagonal line passing through it. She uses Bresenham's Circle Drawing Algorithm to draw a circle with radius 10 units centered at origin (0,0), and then uses DDA Line Drawing Algorithm to draw a line from point (0,0) to point (12,5).

During the rendering process, she notices that the line passes through or touches several of the pixels that were already plotted by the circle algorithm.

Given that:

- Bresenham's circle algorithm plots points in the first octant starting from (0,10)
- DDA calculates increments as $\Delta x = 12$ and $\Delta y = 5$, with steps = 12
- A pixel is considered "overlapping" if both algorithms plot the exact same (x,y) coordinate

Calculate the total number of unique pixels that need to be illuminated on the display (i.e., total pixels from both algorithms minus any overlapping pixels).

ALL THE BEST