Name:

Enrolment No:

UPES
UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Online End Semester Examination, May 2021

Course: Computer Graphics **Semester: VI**
Program: B. Tech. (CSE) **Time : 03 hours**
Course Code: CSEG 3003 **Max. Marks: 100**

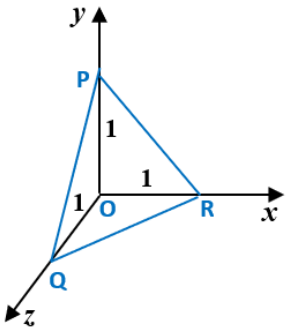
SECTION A

1. Each Question will carry 5 Marks
2. The answers in this section are to be typed in. Sentence type answers should not exceed three sentences.

Q1	(a) How much memory would be required to design a 1280 X 1024 pixels monochrome display? (Write answer only) (b) If we use direct coding of RGB values with 3 bits per primary colour, how many possible colours do we have for each pixel? (Write answer only) (c) Compute the size of a 640 X 480 image at 240 pixels per inch. (Write answer only)	**2, 1, 2**	**CO1**
Q2	(a) Write the names of any *two* aliasing effects. Name the techniques to overcome these effects. (b) A line segments can be scan converted directly using the line equation, i.e., $y = mx + c$. Then why Bresenham's algorithm is used for scan converting line segments? Specify the reason(s).	**3, 2**	**CO2**
Q3	(a) Consider the recursive versions of flood-fill and boundary-fill region filling algorithms. Answer the following questions in the context of each of these algorithms: (i) For which region definition you apply this algorithm? (ii) What is the recursion termination criterion? (iii) How can the number of recursive calls be reduced?	**2, 2, 1**	**CO2**
Q4	(a) Specify the conditions to identify the line segments under visible, invisible, and partially visible categories for Cohen-Sutherland clipping algorithm. (b) A two-dimensional point P(3, 4) is represented in homogeneous format as (3, 4, 1). Write two alternative homogeneous representations for this point P.	**3, 2**	**CO3**
Q5	(a) Write two examples each of the Object and Image Space methods for Hidden Surface Elimination. Also brief why do they fall in the mentioned category (maximum three lines). (b) The _____ type of curves can provide the larger number of control points and can provide local control over the curve.	**4, 1**	**CO4**
Q6	(a) Diffused reflection at a point is given as $I = I_s K_d \cos(\theta)$. Here, θ is the angle between _____vector and _____ vector. The range of diffusion-reflection coefficient K_d is _____. (b) Examples of imperfect mirror-type surfaces are _____ and _____.	**3, 2**	**CO5**

SECTION B

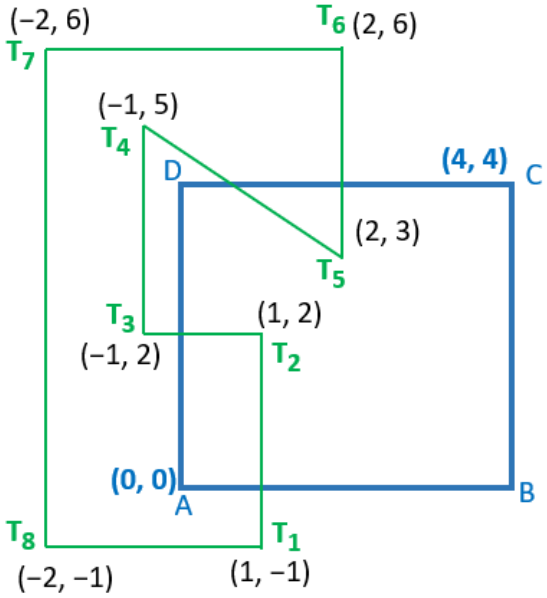
1. Each question will carry 10 marks
2. These answers are to scanned and uploaded.

Q7	(a) Sketch a general Computer Graphics pipeline explaining each step in brief. (b) Explain briefly LCD and LED displays.	**6, 4**	**CO1**
Q8	Consider a circle specified by the equation $(x - 10)^2 + (y - 5)^2 = 64$. Execute mid-point algorithm to scan convert this circle in the first and second quadrants. Show the states of algorithmic parameters during each iteration of the algorithm.	**10**	**CO2**
Q9	A mirror is placed vertically such that it passes through the points **(10, 0) and (0, 10)**. Find the reflected view of the triangle ABC with vertices A **(5, 50)**, B **(20, 40)**, C **(10, 70)**.	**10**	**CO3**
Q10	(a) A unit, solid pyramid is placed in the Cartesian Coordinate Space as shown in the figure given below. If viewed from a point **(2, 2, 2)**, determine which of its faces will not be visible.  (b) State how do you determine depth at an arbitrary point (x, y) as per Z-Buffer algorithm.	**8, 2**	**CO4**
Q11	(a) Find the equation of the Bezier curve that passes through **(0, 0)** and **(–4, 2)**, and controlled through **(14, 10)** and **(4, 0)**. (b) Discuss Specular Reflection model and state its significance in determining illumination at a surface point. OR (a) A cubic Bezier curve segment is described by the control points $P_0(2, 2)$, $P_1(4, 8)$, $P_2(8, 8)$, and $P_3(9, 5)$, Another curve segment is described by $Q_0(a, b)$, $Q_1(c, 2)$, $Q_2(15, 2)$, and $Q_3(18, 2)$. Find the values of **a**, **b**, and **c** so that the two curve segments join smoothly. (b) Discuss Gouraud shading. Explain briefly the interpolation technique adopted by Gouraud shading to determine intensity at an arbitrary point on solid surface.	**5, 5** **5,5**	**CO5**

SECTION C

1. Each Question carries 20 Marks.
2. Answer in this section is to be scanned and uploaded.

Q12	(a) A pyramid defined by the coordinates **A(0, 0, 0)**, **B(1, 0, 0)**, **C(0, 1, 0)**, and **D(0, 0, 1)** is mirror reflected in a plane that passes through **C(0, 1, 0)** and has a normal vector of direction **N = I + J + K**. Find the coordinates of the transformed pyramid. (b) Determine the normalization transformation that maps vertices defined in world coordinate system (WCS) window **W** to a display window **D** in Device Coordinate	**14, 6**	**CO3**

	System (DCS). Lower left and upper right corners of W and D are **(–5, –5)**, **(5, 5)** and **(0, 0)**, **(200, 200)**, respectively. **OR** (a) Execute Sutherland-Hodgman algorithm to clip the target polygon $T_1T_2T_3T_4T_5T_6T_7T_8$ against a rectangular clipping window ABCD shown in the figure given below. Show the sequence of coordinates included in the vertex output list during each iteration of the algorithm.  (b) Discuss Weiler-Atherton polygon clipping algorithm. Is it superior to Sutherland-Hodgman algorithm? Justify your answer.	**12, 8**	