Name: **Enrolment No:**	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2022

Course: Computer Graphics **Semester: 6**
Program: B.Tech CSE (CCVT, IoT, GG) **Time: 03 hrs.**
Course Code: CSEG3003 **Max. Marks: 100**

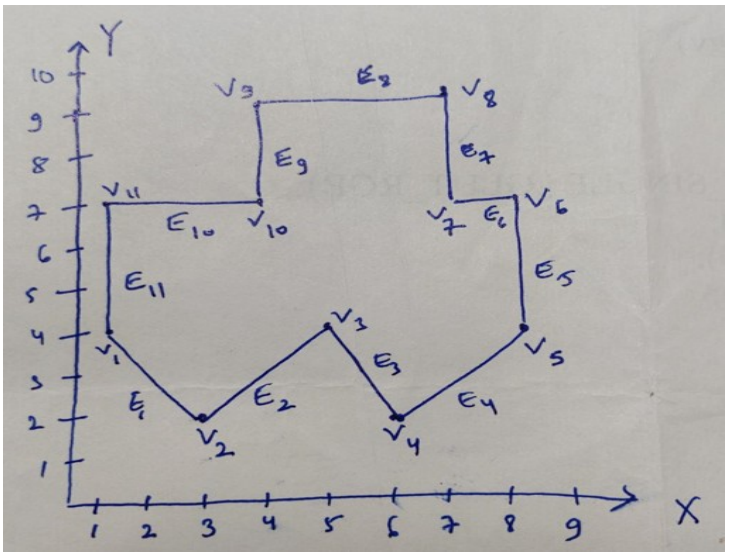
Instructions:

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	*"Coordinate free geometry (CFG) is a style of expressing geometric objects and relations that avoids unnecessary reliance on any specific coordinate system."* Explain.	**4**	**CO 3**
Q 2	There are 100 successive translation operations performed on an object with translation vectors (1, 2), (2, 3), (3, 4) … (100, 101). Determine the resultant translation matrix.	**4**	**CO 4**
Q 3	When is a bilinear patch not equivalent to a planar patch? Explain with derivation.	**4**	**CO 2**
Q 4	Set a Bezier curve with three control points as (3, 4), (6, 9) and (10, 10). *(Only drawing a graph with the approximation points is needed).*	**4**	**CO 4**
Q 5	Differentiate between Convex and Concave polygons.	**4**	**CO 1**

SECTION B
(4Qx10M= 40 Marks)

Q 6	Given a triangle with points (1, 1), (0, 0) and (1, 0). Apply shear parameter 2 on X-axis and 2 on Y-axis and find out the new coordinates of the object.	**10**	**CO 2**
Q 7	Suppose we have a computer with 32 bits per word and a transfer rate of 1 MIPs. How long would it take to fill a frame buffer of a 300 DPI (Dots per inch) laser printer with a page size of 8.5 inches by 11 inches? (Consider 1 dot=4 bits).	**10**	**CO 1**
Q 8	The coordinates of the vertices of a polygon are shown in given figure with vertices (V1, V2… V11) and edges (E1, E2… E11). a) How many scanlines are involved in coloring of the given polygon using scanline color filling algorithm? b) Draw the SET (Sorted Edge Table) for the polygon without splitting of vertices.	**10**	**CO 4**

	c) State which edges will be active on scan lines y=2, 4, 6, 7, 9, and 10.  OR Write a procedure to implement the Weiler Atherton algorithm.		
Q 9	a) Discuss the similarities and dissimilarities between Bezier curve and B-Spline curve. b) Calculate the number of segments of B-Spline curve, which is controlled through 7 points and order, is 3.	**10**	**CO 3**
	SECTION-C **(2Qx20M=40 Marks)**		
Q 10	Prove the following with proper derivations: a) The inverse of an affine transformation is also affine, assuming it exists. b) Lines and parallelism are preserved under affine transformations. c) Given a closed region, the area under an affine transformation $A\vec{p}+\vec{t}$ is scaled by det (A). d) A composition of affine transformations is still affine.	**20**	**CO 2**
Q 11	a) Derive mid-point circle generation algorithm whose starting point is (-r, 0) and moving towards (-r, r). b) When eight-way symmetry is used to obtain a full circle from pixel coordinates generated for the 0o to 450 or the 900 to 450 octant, certain pixels are set or plotted twice. This phenomenon is sometimes referred to as overstrike. Identify the points where overstrike occurs. (Consider r is the radius of circle) Or	**20**	**CO4**

	Find the normalization transformation N for window to viewport mapping which uses the rectangle A(1,1), B(5,3), C(4,5), D(0,3) as a window and normalized device screen having coordinates (0,0) as bottom left corner and (1,1) as top right corner as a viewport. .		