Name: Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Online End Semester Examination, December 2020

Course: Advanced Computer Graphics   **Semester:** VII
Programme: B.Tech. (CSE) spl. in Graphics & Gaming   **Time:** 03 hrs.
Course Code: CSGG 4002   **Max. Marks: 100**
Instructions: Attempt all questions. There are internal choices in Q. No. 11 and 12.

SECTION A
Note: Answers in this section are to be typed in and each question will carry 5 marks.

Q 1	An OpenGL function call is made as *glOrtho*(– 3.2, 3.2, – 2.4, 2.4, 1, 50). Convey the purpose of the function call and specify meaning of the arguments.	**5**	**CO1**
Q 2	State Euler's formula for verifying a simple polyhedron. Specify the meaning of each parameter in the formula.	**5**	**CO2**
Q 3	Consider a camera with eye point set at (4, 4, 4) that looks down on a point (0, 1, 0). If an upward point is guessed as (0, 1, 0), vectors u, v, and n are computed as _____, _____, and _____, respectively. Give an OpenGL function call to make the above stated viewing arrangement.	**5**	**CO2**
Q 4	Consider a polygon with vertices A(6, 1, 4), B(7, 0, 9), and C(1, 1, 2). The normal to this polygon using Newell's method is _____.	**5**	**CO3**
Q 5	(a) The colour of an object is largely determined by its diffuse reflection coefficient. Given K_d = (0.8, 0.4, 0) if incident light is blue, the color of the object is _____. (b) Amount of diffused reflection is given as $I_s = I_s\,K_d\cos(\theta)$. Here, θ is the angle between _____ and _____.	**3, 2**	**CO3**
Q 6	List two OpenGL texture mapping functions with their two lines description.	**5**	**CO4**

SECTION B
Note: Answers in this section are to be scanned and uploaded. Each question will carry 10 marks.

Q 7	(a) Express the sequence of steps to rotate a 3D primitive about an arbitrary axis. Give the OpenGL syntax to perform 3D rotation. (b) Derive an expression to map world window coordinates to viewport coordinates.	**6, 4**	**CO1**
Q 8	(a) Explain perspective projection with diagram. Discuss about vanishing points. (b) Differentiate between cavalier and cabinet parallel projections.	**6, 4**	**CO2**

Q 9	(a) Draw and explain a general 3D viewing pipeline.	**6, 4**	**CO2**
	(b) Define a canonical view volume.		
Q 10	(a) List various methods of modeling solids. Explain sweep representation technique for modeling a sphere.	**6, 4**	**CO3**
	(b) In addition to Euler's formula, state the additional constraints for qualifying the definition of a polyhedron.		
Q 11	(a) Explain Gouraud shading. Discuss how Phong shading differs from it.	**5, 5**	**CO3**
	(b) Discuss specular reflection of light on an object surface.		
	OR		
	(a) Discuss the effect of distance between light source and object on diffuse reflection.	**5, 5**	**CO3**
	(b) What is the impact of exponent *m* in the specular component of Phong model? Explain.		
	SECTION C **Note: Answers in this section are to be scanned and uploaded. Each question will carry 20 marks.**		
Q 12	(a) Discuss how to apply a texture on a planar surface.	**6, 6, 8**	**CO4**
	(b) Explain programmable shaders in OpenGL.		
	(c) Explain Ray Tracing algorithm with neat diagram.		
	OR		
	(a) Discuss OpenGL surface texture and volume texture functions.	**6, 6, 8**	**CO4**
	(b) Explain bump mapping.		
	(c) Explain the concept of Radiosity with neat diagram.		