Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2019

Course: Advanced Computer Graphics (CSEG459) **Semester: VII**

Programme: B.Tech. (CSE spl. GG)

Time: 03 hrs. **Max. Marks: 100**

Instructions: Attempt all questions. There are internal choices in Q. No. 9 and 11.

	SECTION A		
Q 1	Define a canonical volume in the context of 3D viewing.	**4**	**CO1**
Q 2	Differentiate between vertex normal and face normal.	**4**	**CO2**
Q 3	Discuss how incident light interacts with the object surfaces.	**4**	**CO3**
Q 4	Differentiate between global and local illumination with the help of example.	**4**	**CO3**
Q 5	List at the least four OpenGL texture mapping functions with their one/two lines description.	**4**	**CO4**
	SECTION B		
Q 6	Define perspective foreshortening and vanishing points in the context of projection. Derive the matrix transformation for standard perspective projection where view plane is xy plane and the center of projection is taken as (0, 0, –d).	**4+6**	**CO1**
Q 7	Justify that the cross product method of finding normal efficient? If not, state the reason(s). Suggest an alternative and robust way to determine normal to a planar surface. Is the suggested method good for non-planar polygons?	**4+ 4+ 2**	**CO2**
Q 8	Explain smooth shading in the context of Gouraud and Phong models. Suggest how Phong shading can be speeded up.	**7+3**	**CO3**
Q 9	Describe texture mapping with brief discussion on linear and surface texture patterns. Discuss bump mapping.	**6+4**	**CO4**
	OR		
	Discuss OpenGL surface texture and volume texture functions.	**10**	**CO4**
	SECTION C		

Q 10	Elaborate the basic ray tracing algorithm. Discuss how space-subdivision methods reduce intersection computations. Discuss radiosity.	**4+8 + 8**	**CO4**
Q 11	(a) Draw and explain a 3D graphics pipeline. Describe the graphics pipeline in OpenGL and discuss its conformance to the above-mentioned 3D graphics pipeline. (b) Explain in brief programmable shaders.	**4+8 +** **8**	**CO2** **CO3**
	OR		
	(a) Define polyhedron by giving two examples and state its requirements. (b) Define Euler number. Compute Euler number for a cube. (C) Discuss how the three light contributions – diffuse, specular, and ambient are combined to form total amount of light that reaches the eye. Also, suggest how this shading model can be extended to include colors.	**6** **6** **4+4**	**CO2** **CO2** **CO3**