Questions on GVC Lectures 16 TO 24 (Finite Time Assessment)

Lectures: 16, 17, 18, 19, 20, 21, 22, 23 and 24

Date November 02, 2021
2 Hours: 7:00 to 9:00PM

On the Top margin of each paper Students should write their
i) Roll No, ii) Name and iii) Signature.
iv) Question No on the Left Margin.
These pages should be scanned in order and uploaded preferably as a single PDF file. Please install Adobe Scan to take the pictures of your answer pages for uploading it (Preferably in PDF). ***Do not Scan at high resolution so that the file size is large and it becomes difficult to upload it from your end.***

Do not share your login and password of your IITA e-mail. Any Malpractice of uploading through a single IP no, Uploading someone else's answer Sheet IS A CRIME. THE STUDENT will automatically fail the course.

These are difficult times. Your sincerity towards learning and ethical practice is expected from all of you.

[Marks: 40X1=40.
There will be marking the answer should be at least 75% correct to obtain 1 otherwise the marking will be 0.

I. ***Those who submit with 1st ½ hour will get bonus 5 marks]***
II. ***Those who submit within ½ to 1 hour will get bonus 3 marks***
III. ***Those who submit within 1 to 1-½ hour will get bonus 2 marks***
IV. ***Those who submit late by 1 hour, -1 marks.***
V. ***Those who submit late by n hour, -n marks (Negative marks will be reset to 0).***

If a student has gone through my lectures and read the book he will surely get the bonus marks while the student who has not done any effort will find it difficult to reply within the time frame.

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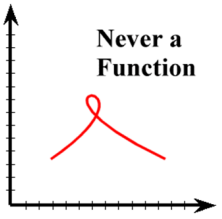
1. The Curve shown in the figure is ***self intersecting***. To mathematically generate such curves should we use **Explicit**, **Implicit** or **Parametric**? Explain why?



2. write the **Explicit**, **Implicit** and **Parametric** equation for a **circle**. Modify one of the equations (**Explicit**, **Implicit** or **Parametric)** of the **circle** so that it becomes a ***self intersecting curve*** as shown in the figure of Q-1.
3. What is the difference in the **Control Points** for the i)**Interpolating Spline** and ii)**Approximating Spline**?
4. What are **C0**, **C1**, **C2**, …….**Cn** Continuity of a line passing through multiple vertices?
5. In Hermite Spline what are the geometric constraints for fitting a cubical spline (A Cubical Polynomial)?

6. For obtaining a line with **C0**, **C1** and **C2** continuity what are the geometric constraints required and what will be the order of the spline polynomial?

7. Spline fits a smooth curve between vertices (1 & 2) and (2 & 3) …. (k-1 & k) and (k & k+1). How is the C1 continuity conserved at the vertices 2, 3, ….., k-1, k?

8. In the equation $x(u) = U \cdot M_{spline} \cdot M_{geom}$, What is M_{geom}? How do we obtain the blending functions from this equation?

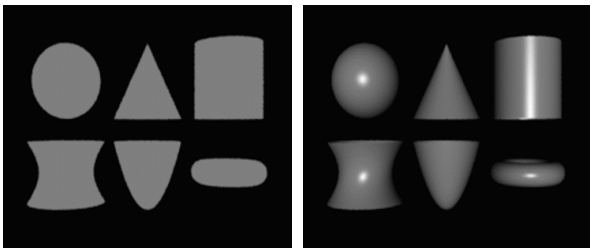
9. What is the significance of having just 4 Blending functions Hermite or Bézier.

10. Bézier Spline Matrix is derived from Hermite Spline Matrix by multiplying Hermite Spline Matrix by:? --- Explain in short how you get this matrix.

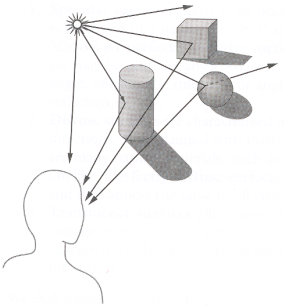
11. What is the effect of tension parameter ***t*** and the bias parameter ***b*** in the other specialized splines?

12. Why was B-Spline preferred while making the movie Terminator -II to other splines?

13. What are the differences between the left and right images? Though both are in grayscale, which one of the looks realistic and desirable while displaying any graphics?



14. Illumination models fall into two categories: i) **Empirical**: ii) **Physically based**. What are these two categories?



15. i) When is an object, is visible by the observer/camera?
ii) Does all light from the source reach the observer?

16. How is the Ray tracing algorithm made efficient?

17. The figure shows a light source (sun). The light from this source reflects from different objects to reach the observer. i) How many rays are shown to be single scattering? ii) Do all rays reach the observer? How is it depicted in the figure?

18. i) Which object exhibits a refraction? ii) If an object refracts, what can you say about the scattered/reflected “ray intensity” that reaches the observer? iii) What can you tell about the object where the refracted ray reaches the observer?

19. To achieve the visual effects that matches reality, an empirical model of illumination is constructed. Why are two components of the illumination model (**light sources** and **surface properties)** considered?

20. Can the Source of “***Ambient illumination***” be determined and a direction of illumination be fixed?

21. The model illumination is conceptualized as _____ .

22. The intensity of ambient light is independent of _____ .

23. What is $K_E(\lambda)$ term and why can it also be written as $I_E(\lambda)$?

24. What is the effect of Diffuse lighting (or diffuse reflection) in the illumination model?

25. The level of the Diffuse lighting (or diffuse reflection) depends on _____, and is known as _____.

26. Why is the direction of the Observer / Camera not required for the Diffuse lighting (or diffuse reflection) term in the illumination model?

27. What does the specular lighting term in the illumination model provide?

28. Why does the specular lighting term in the illumination model depend on the direction of ideal mirror reflection and why is the direction of the Observer / Camera required?

29. How is the direction of ideal mirror reflection $\widehat{R}$ derived in function of the direction of illumination $\widehat{L}$ and the normal $\widehat{N}$ to the surface of the object being illumined?

30. What makes the specular lighting term have a spread w.r.t. ideal mirror reflection?

31. Write the final illumination model for multiple sources knowing all the direction of the light sources $\widehat{L}$ and the normal $\widehat{N}$ to the surface of the object being illumined.

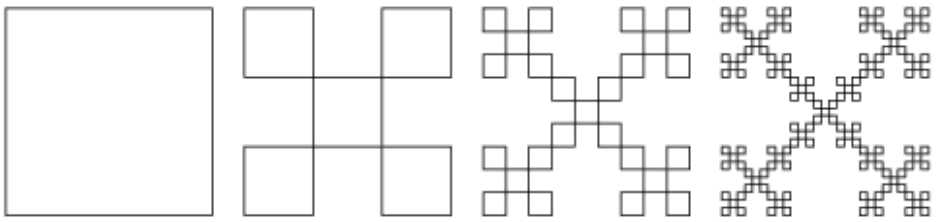
32. Define fractal. Give some natural examples of fractals.

33. What are the different branching patterns observed in fractals (w.r.t. human organs)?

34. Derive and determine the fractal dimension for a Sierpinski triangle.

35. Describe a box fractal. Why is it not practical to generate fractals in real time?

36. What will be the fractional area of a single square 2D "Box Fractal" after 7 iterations given that the area of the initial box is $9 \times 9 = 81\, m^2$?



37. What is the dimension of the above fractal?

38. What are the fractal dimensions of Koch curve and Sierpinski Gasket? Explain.

39. Is a core in an Intel CPU and a NVIDIA GPU the same?

40. Explain how a linear search algorithm can be efficiently executed on a GPU?

41. Elaborate how content switching among active threads in a GPU is efficient?

42. How latency hiding helps a GPU to perform faster?

43. Are the number of active threads and the number of streaming processors the same in a GPU?

44. Q6. What is the difference in configuration of a system, one with an integrated and another with a discrete GPU?

45. What is a shader?

46. How does double buffering help in better graphical rendering?

47. How does unified memory ease the effort of a programmer writing CUDa programs?

48. Briefly explain different ways in which a GPU can be programmed.

49. How does cache in a GPU differ from that in a CPU?

50. Kernel function of a CUDA program can be implemented in two ways. One using if{}else{} and another without. Rest everything, the number of instructions, the number of memory accesses ... are the same. Which one will execute faster on a GPU and Why?