INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, ALLAHABAD

C3 Assessment, 20 November 2022

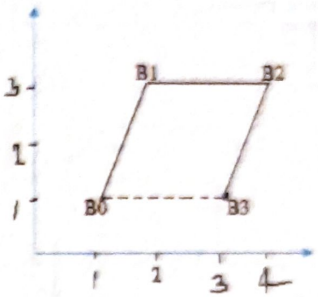
Graphics & Visual Computing IGVC-5211

B.TECH IT: V - Semester

Full Marks - 10 **Time – 1 hrs.**

Note: Calculators without internet allowed. ***Answers should be brief and to the point. Excessive writing will attract Negative marks. If any unfair means found during the test, copy will be taken back.***

1. Given $B_0[1,1]$, $B_1[2,3]$, $B_2[4,3]$ and $B_3[3,1]$ the vertices of a Bezier polygon, compute a Bezier spline passing through these 4 vertices (Node). Use the previous vertex as the control vertex (B_3 is the control vertex of B_0, B_0 is the control vertex of B_1.....). Calculate the mid-points ($u = 0.5$) on the spline between (B_0 -- B_1), (B_1 -- B_2), (B_2 - B_3) and (B_3 - B_0).



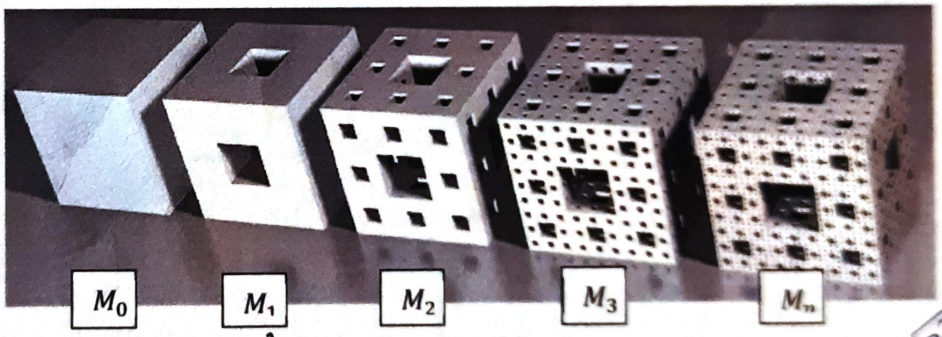
[3]

2. $M_\infty = lim_{n\to\infty} M_n$ is called the Menger Sponge.

a) What is the volume of M_n.

b) What is the surface area of M_n?

c) Compute the fractal dimension of M_∞.



[1+1+1=3]

3.a) Explain and derive the different terms (Emission, Ambient, Diffused reflection and Specular reflection) in the illumination equation used in graphics. The directions of the different sources of light $\hat{L}_i$, the normal to the surface $\hat{n}$, and the viewer/camera position $\hat{V}$. Please explain the equation in terms of these terms only.

b) Make a schematic representation of the different terms of illumination and how it changes with the angle between $\hat{L}_i$ and $\hat{n}$.

d) The illumination equation does not show the effect of shadow. Knowing $\hat{L}_i$ and using the ray-tracing method explain with a pseudo code how one could determine if the particular point on the object is the shadow or not. What will you change in the illumination equation if the particular point is in the shadow?

[1 + 1 + (1+1) = 4]