CS6533/CS4533 Midterm Exam Sample Questions

Q.1.
(a) If the screen of our workstation has a resolution of 1280×1024 pixels, and we want to refresh it 75 times per second, then how much time can it take to read one pixel from the frame buffer memory? (You can leave an arithmetical expression without calculating it.)

(b) In a pinhole camera, if the film plane is located at distance d from the pinhole and the camera height is h, then how big is the angle of view θ? You should express θ in terms of d and h.

(c) Consider the double buffering technique. (1) What is the purpose of this technique (in terms of the issue(s) that the technique tries to resolve)? (2) Describe how double buffering works.

Q.2
Give the sequence of transformations (assuming the rightmost transformation is applied first) that transforms a 2×2 square A (centered at $(-4, -3)$ with the top-down diagonal parallel to the y-axis) to the 1×1 square B (with the lower-left corner at $(3, 0)$) as shown below.
(Use the following notation: $R(\theta)$ means the 2D rotation about the origin by a counterclockwise angle of θ; $T(a, b)$ means the 2D translation by a vector of (a, b); $S(a, b)$ means the 2D scaling with the scaling factors a in the x-dimension and b in the y-dimension.)
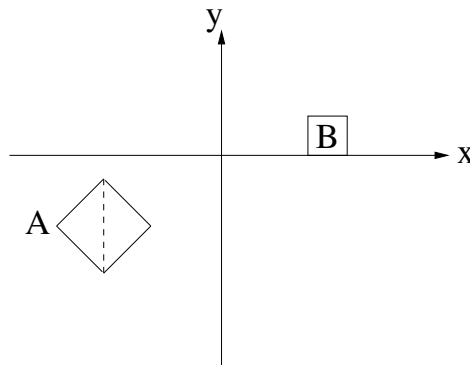
Q.3
For the function `LookAt()`, you need to know how to derive the matrix when you are given the parameters VRP, VPN, and VUP, and how to verify the correctness of the matrix, as covered in the lectures.

Q.4
As said in class, HW2 will be tested. In particular, you need to know how to set up the rotation and translation transformations, etc., to produce the desired sphere rolling effects and to have the correct rolling transition from one rolling segment to the next.