**Chapter 2**

**Graphics Hardware (Numerical)**

1. **If pixels are accessed from the frame buffer with an average access the 300ns. Then will this rate to produce the flickering effects? (Screen Resolution = 640x480)**

***Solution:-***

Given access time for 1 pixel = 300ns

Access time for 640x480 pixels = 640\*480\*300 = 9,21,60,000 ns = 0.09216 seconds

Frequency (f) = = 10.85 frame per second (fps)

This value is lesser than 50fps, so flicker occurs.

1. **Consider the raster system with resolutions is 640x480. What will be the size of the frame buffer in bytes?**

***Solution:-***

Size in frame buffer for 1 pixel = 8 bit

For 640x480 pixels, size in frame buffer = 640x480x8 bits = 300 Kbytes

1. **Consider 1024 pixel x1024 scan lines image with 24-bit true color. If 10 minutes video is required to capture, calculate the total memory required?**

***Solution:***

[1024pixelx1024pixel = 10,48,576 pixels per frame.]

Memory required for 1 second = 1024x1024x24bitsx30fps [Standard video is 30 frame per second]

= 75,49,74,720 bits

For 10 minutes, total memory required = 10x60x75,49,74,720 bits

= 50.73 GB

1. **Find out the aspect ratio of the raster system using 8x10 inches screen and 100 pixel/inch.**

***Solution:-***

We know that,

Aspect Ration = = =

Therefore, Aspect Ratio = 4:5

1. **If we want to resize at 1024x768 image to one that is 640 pixels wide with the same aspect ratio, what would be the height of the resized image?**

***Solution:***

Aspect Ratio = =

Even, after the image is rasterized, the aspect ratio remains same. So,

=

H= 480.

1. **Consider two raster systems with resolutions of 640 by 840 and 1280 by 1024. How many pixels could be accessed per second in each of these systems by a display controller that refreshes the screen at a rate of 60 frames per second? What is the access time per pixel in each system? [2013 Fall]**

***Solution:***

1. Total pixels = 640x840

Refresh Rate = 60 frames per second

Pixels accessed per second (f) = 640x840x60

= 3.2256x107 pixels/second

Access time per pixel = = 31 nanoseconds/second

1. Total pixels = 1280x1024

Refresh Rate = 60 frames per second

Pixels accessed per second (f) = 1280x1024x60

= 7.86432x107 pixels/second

Access time per pixel = = 12.7 nanoseconds/second

1. **Consider a raster scan system having 12 inch by 10 inch screen with a resolution of 100 pixels per inch in each direction. If the display controller of this system refreshes the screen at the rate of 50 frames per second, how many pixels could be accessed per second and what is the access time per pixel of the system?**

***Solution****:*

Total pixels = 12x100x100x100

Refresh Rate = 50 frames per second

Pixels accessed per second (f) = 12x100x10x100x50

= 60000000

Access time per pixel = = 1.667x10-8 second

1. **How long would it take to load a 640 by 480 frame buffer with 12 bits per pixel, if 105 bits can be transferred per second? How long would it take to load a 24-bit per pixel frame buffer with a resolution of 1280 by 1024 using this same transfer rate?** [Spring 2010]

***Solution****:*

1. Total number of bits for the frame = 640 x 480 x 12 bits = 3686400 bits

As per question 105 bits can be transferred per second.

So, 3686400 bits can be transferred in = = 35,108.6 seconds

1. Total number of bits for the frame = 1280 x 1024 x 24 bits = 3,14,57,280 bits

As per question 105 bits can be transferred per second.

So, 3686400 bits can be transferred in = = 2,99,593.14 seconds