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Lecture - 25
Evolution of Technology in Computer Screen, Numerical Problems

So, during this session, we will be discussing one important issue called Use of Material Handling Aids, Types of Material Handling Devices, Numerical Problems.

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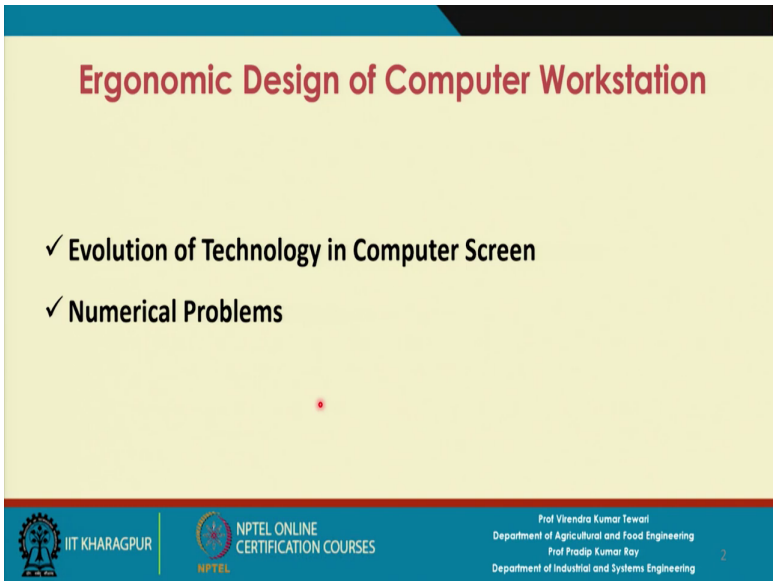

Over the years lot of developments have taken place in the design of the computer systems or computer workstations. And, particularly the kinds of computer screen we use today, it is totally different from what we use 30 years back or 40 years back. So, there is the evolution of technology in the computer screen.

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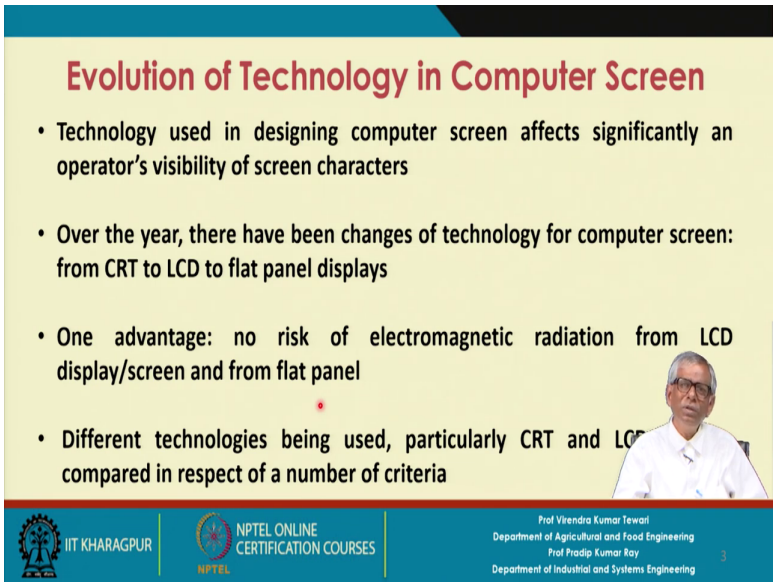

We have discussed in detail one important issue regarding the methods you employ to reduce the glare or the reflections on the screen. So, in that context you will find that we do screen selection of the filter. These are the alternatives but one should make sure that there will be no glare or the reflections and the contrast ratio is also more.

The filter will definitely reduce the glare or reflection on the screen and as well as it also helps in increasing the contrast ratio. There are certain the ways you can measure the contrast ratio and there may be certain problems you will facing, for different types of screens, different types of the filters.

Technology used in designing computer screen affects significantly and operator's visibility of screen characters. Over the year, there has been changes of technology for computer screen. Initially we use CRT and then it was upgraded to LCD and now we use flat panel display. One major advantage is there is no electromagnetic radiation from LCD displays or screen and from flat panel. Different technologies are being used, particular CRT and LCD compared in respect of number of criteria.

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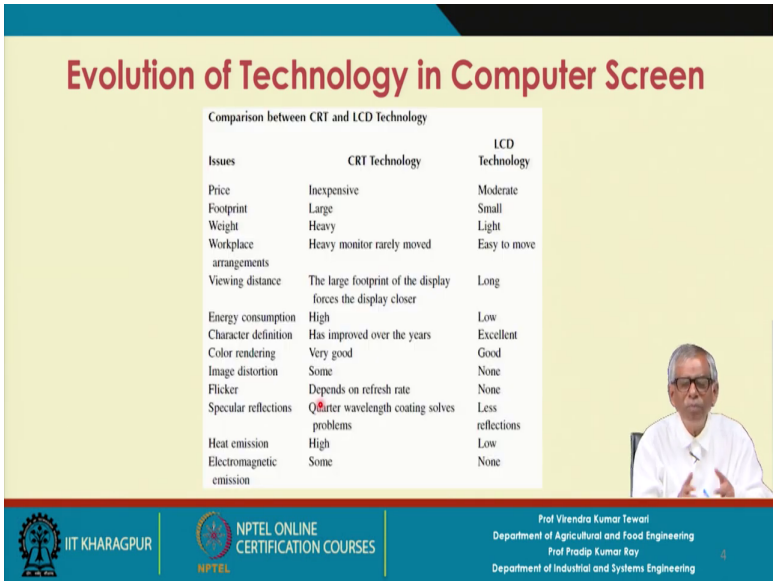

So, let me just the compare between these technologies. There are several factors. So, let us highlight all these factors. So, let us compare the CRT technology with LCD technology. Now, as far as price is concerned, CRT technology is inexpensive whereas LCD technology is moderate. Initially, when a new technology is introduced usually the price for getting the technology is very high, but as the time passes the technology becomes matured and usability increases you will find that the price decreases.

Second one is the footprint- CRT is large whereas LCD is small. Third one is the weight, CRT technology is heavy, whereas, the LCD technology is light. This is a lightweight technology. Workplace arrangements CRT technology is heavy monitor and rarely moved and is in a fixed location where as LCD technology is easy to move, that is a great advantage. Viewing distance is one of the design elements so, for CRT the viewing distance has the large footprint of the display forces the display closers, whereas, for LCD the view distance is long, from a long distance you will see the characters on the screen.

Energy consumption for CRT technology is very high, but if it is LCD technology it is low. Character definition has improved over the years for CRT and for LCD it is excellent. If you use LCD technology, flat panel it is excellent. Color rendering very good for CRT but for LCD is good. So, that way CRT technology is better. Image distortion is some for CRT and for LCD it is none, perfect image you will get.

The flicker depends on the refresh rate for CRT and for LCD is none, there is no flicker. Specular reflections, for CRT it is quarter wavelength coating solves problems. But for LCD it is a less reflections; that means, if you use LC technology, the glare is will be almost absent. Heat emission high for CRT, heat emission is low for the LCD technology.

And, electromagnetic emission, if you use CRT technology, then there could be electromagnetic emission. But, if you use LC technology, there is hardly any radiation.

So, the LCD technology is better that is why in majority of the cases throughout the world, the LCD technology is adopted.

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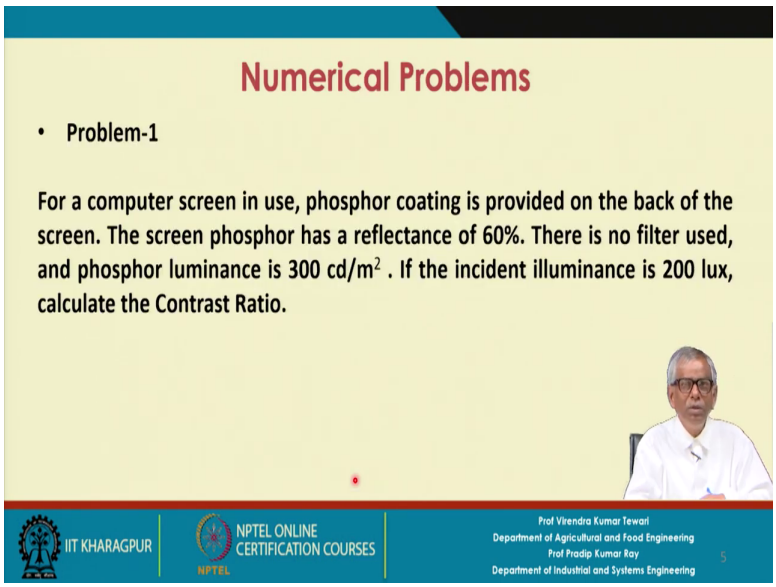

Now, before I discuss these numerical problems, now as I have already told you that the kinds of the visual environment you create. The first you create the visual environment and then you bring in the computer computers because, whether there is computer workstation or not, there is a working environment. And, as soon as you say working environment; obviously, one of the important aspects is the visual environment.

So, let us first discuss problem number 1.

Problem-1: For a computer screen in use, phosphor coating is provided on the back of the screen. The screen phosphor has a reflectance of 60%. There is no filter used, and

phosphor luminance is 300 cd/m2 . If the incident illuminance is 200 lux, calculate the Contrast Ratio.

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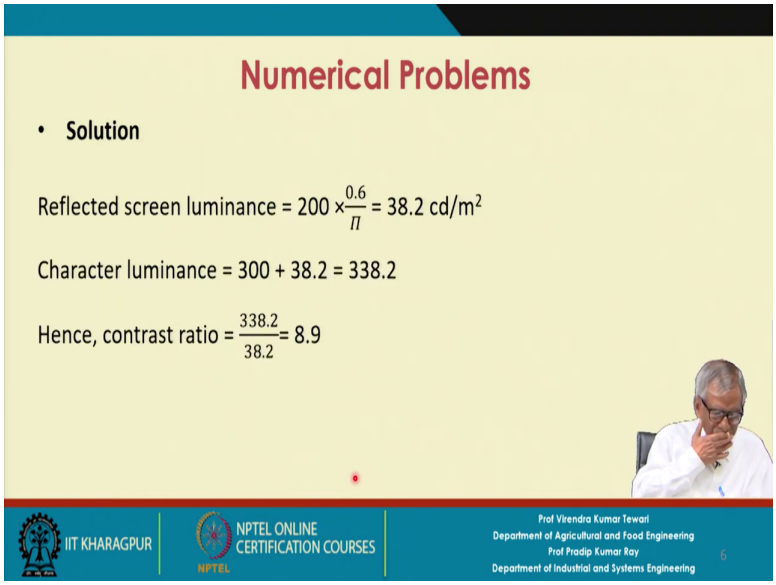

Solution:

Reflected screen luminance = 200 ×0.6/*Π* = 38.2 cd/m2

Character luminance = 300 + 38.2 = 338.2

Hence, contrast ratio = 338.2/38.2= 8.9

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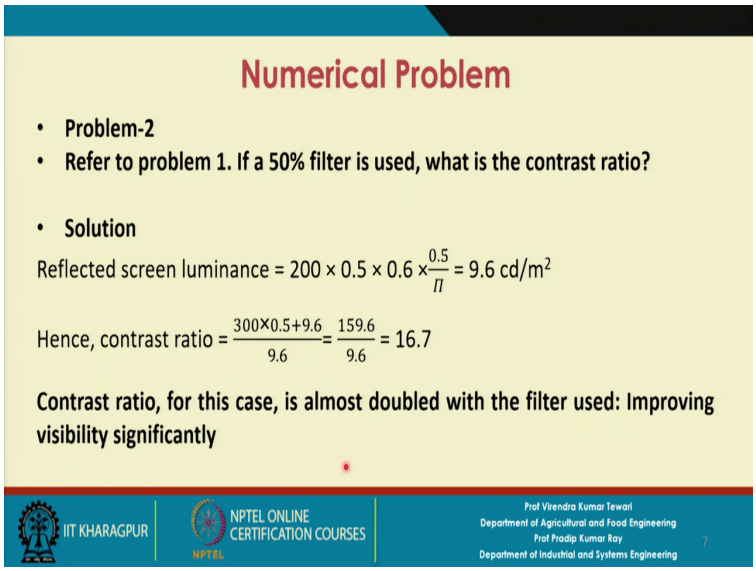

Problem-2: Refer to problem 1. If a 50% filter is used, what is the contrast ratio?

Solution- Reflected screen luminance = 200 × 0.5 × 0.6 ×0.5/Π = 9.6 cd/m2

Hence, contrast ratio = (300"×" 0.5+9.6)/9.6= 159.6/9.6 = 16.7

Contrast ratio, for this case, is almost doubled with the filter used: Improving visibility significantly.

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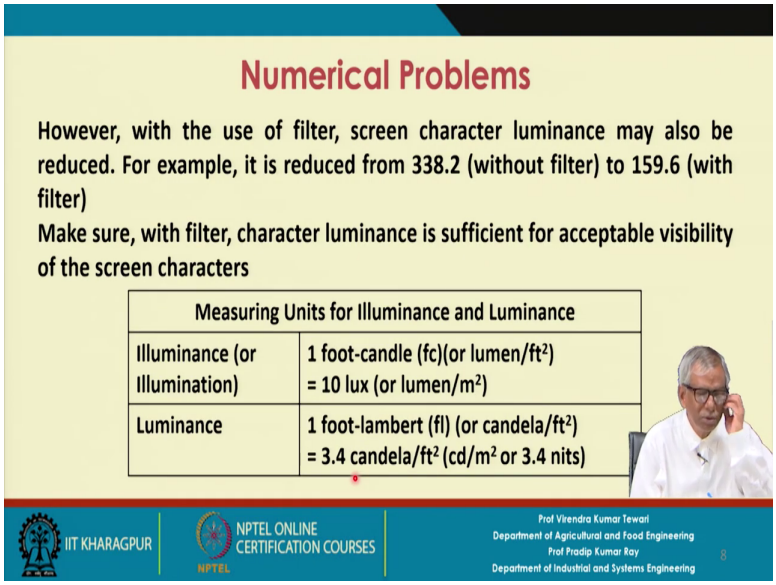

However, with the use of filter screen character luminance may also be reduced. For example, it is reduced from 338.2, it was 338.2 without filter, but when you use a filter it will become one 159.6 with filter.

So, that is why character on the screen becomes less bright, but our main focus is the contrast ratio, if the contrast ratio is less; ultimately your visibility will be affected. And, if the visibility is affected negatively, obviously, the performance will be affected. And, if the performance is affected there will be error. So, you will make errors, while you carry out a task which is called as human error.

So, as far as possible we should improve the design in such a way that human error is sufficiently under control. Even if it is not 0, but let it be the minimum one. Now, make sure with filter character luminance is sufficient for acceptable visibility. So, if you find

it is not acceptable then you have to change the filter with the different specifications. Let us refer to two specific measuring units for illuminance as well as the luminance.

So, the amount of light falling on a on a surface and the luminance is amount of the light reflected from the surface. So, now, there are the two units; you may opt for either SI units or English unit. Now, the illuminance or the luminance is measured in following way:

Illuminance (or Illumination) = 1 foot-candle (fc)(or lumen/ft2) = 10 lux (or lumen/m2).

Luminance = 1 foot-lambert (fl) (or candela/ft2)

= 3.4 candela/ft2 (cd/m2 or 3.4 nits).

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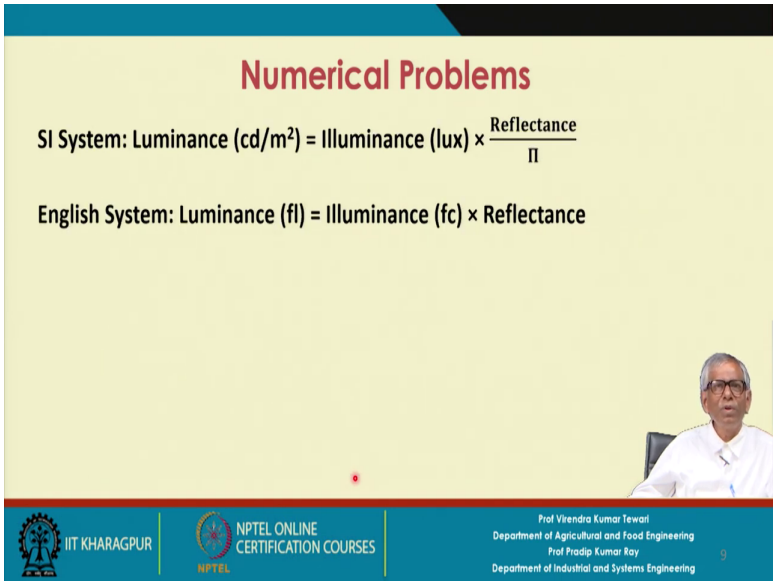

SI System: Luminance (cd/m2) = Illuminance (lux) × Reflectance/II

English System: Luminance (fl) = Illuminance (fc) × Reflectanceus.

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