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BTECH 3RD YEAR

Computer Networks Tutorial 5

Q1: The bandwidth of the light for 1000nm to 1200nm wavelength range is $\frac{2 \times 10^8}{1000 \times 10^{-9}} - \frac{2 \times 10^8}{1200 \times 10^{-9}} = (200 - 166.66) \text{ THz}$
 $\approx \underline{33 \text{ THz}}$

The bandwidth of the light for 1000nm to 1400 nm wavelength range is $\frac{2 \times 10^8}{1000 \times 10^{-9}} - \frac{2 \times 10^8}{1400 \times 10^{-9}} = (200 - 142.85) \text{ THz}$
 $\approx \underline{57.2 \text{ THz}}$

Q2: Given,

length of optical cable = 10m, 100m, 1km.

Propagation speed of light = $2 \times 10^8 \text{ m/s}$.

The delays are:-

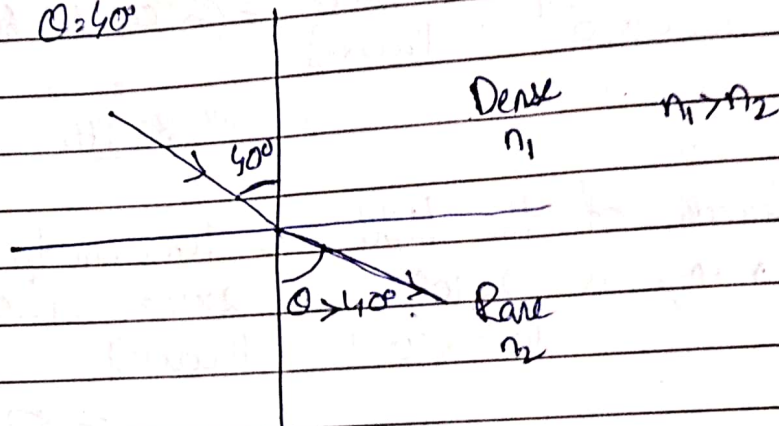
$$\text{For } l=10\text{m, } d = \frac{10}{2 \times 10^8} = 0.05 \mu\text{s}$$

$$\text{For } l=100\text{m, } d = \frac{100}{2 \times 10^8} = 0.5 \mu\text{s}$$

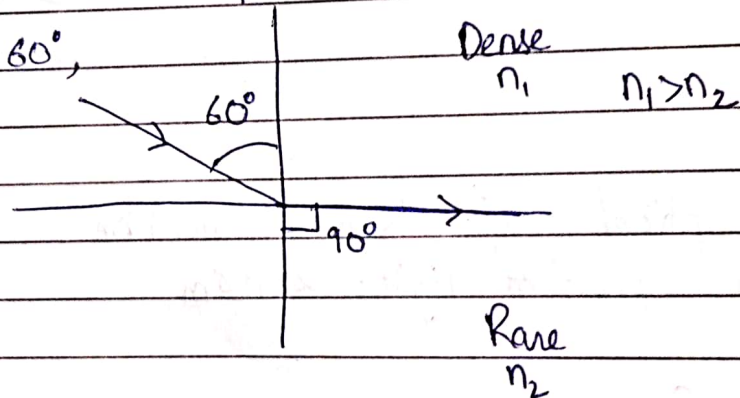
$$\text{For } l=1000\text{m, } d = \frac{1000}{2 \times 10^8} = 5 \mu\text{s}$$

Ans 3: Given the critical angle is 60° .
Light enters from denser medium to rarer medium.

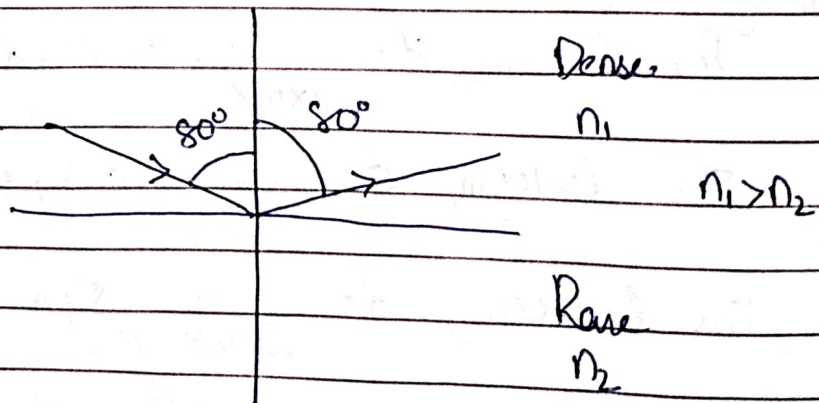
Hence,
With $\theta = 40^\circ$



With 60° ,



With 80° .



Circuit Switched Network

• Circuit Switching is a connection oriented that means a path is established between source and destination before the transmission.

• Circuit Switching was originally designed for voice communication.

• Circuit Switching is inflexible as once a path is established for transmission, it doesn't change while the duration of the session.

• Entire message is received as it is from ~~recei~~ sender to receiver.

• Implemented in Physical layer.

Packet Switched Network

• Packet Switching is connectionless that means a dynamic route is decided for each packet while transmission.

• Packet Switching was originally designed for data communication.

• Packet Switching is flexible as each packet may travel through a different route to reach its destination.

• @ Message is received in form of packets through different paths from sender to receiver.

• Implemented in network layer.

Q. In Space Division Switching, a dedicated path is established between the calling and the called subscribers for the entire duration of the call.

In time division switching, sampled values of speech signals are transferred at fixed intervals.

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The time division switching may be analog or digital.

In analog switching, the sampled voltage levels are transmitted as they are whereas in binary switching, they are binary coded and transmitted.

If the coded values are transferred during the same time interval from input to output, the technique is called Space Switching.

If the values are stored and transferred to the output at a later time interval, the technique is called Time Switching.

A time division digital switch also be designed by using a combination of space and time switching techniques.

Ans 6, Given,

data rate = 1 Mbps

Exchange bits for setup & teardown phases = 1000 bits

Distance b/w 2 parties = 3000 km

Propagation speed = 2×10^8 m/s

Total delay (T) = Delay of setup & teardown + Delay of data transfer

Delay of setup & teardown = $3 \times$ propagation delay + $3 \times$ transmission delay

Delay of data transfer = propagation delay + transmission delay

Delay of setup & teardown = $3 \times \frac{3000 \times 10^3}{2 \times 10^8} + 3 \times \frac{1000}{1 \times 10^6} = 48 \text{ ms}$

a) Time delay $(T) = d_1 + d_2$
 $= 48 + 15 + 1 = 64 \text{ ms.}$

b) Time delay $(T) = d_1 + d_2$
 $= 48 + 15 + 1000 = 1063 \text{ ms}$

c) Total delay $(T) = d_1 + d_2$
 $= 48 + 15 + 1000 = 1063 \text{ ms}$

d) For a, we have 64 ms.
 For b, we have $\frac{1063}{100} \text{ ms} = 10.63 \text{ ms.}$

For c, we have $\frac{1063}{1000} \text{ ms} = 1.063 \text{ ms}$

The ratio of case c is the smallest because of using one setup and teardown phase for sending more data.

- Ans 7, Packet 1: 2, 70
 Packet 2: 1, 45
 Packet 3: 3, 11
 Packet 4: 4, 41

48 ms