INU PESH

Final term

Name : Javid

ID : 13151

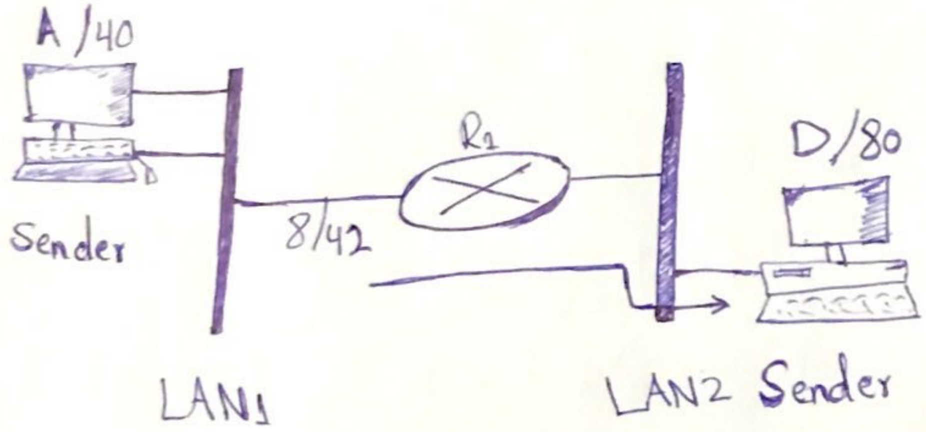
Submitted to : Sir Zain Shoukat

Programe : Bs (Telecom)

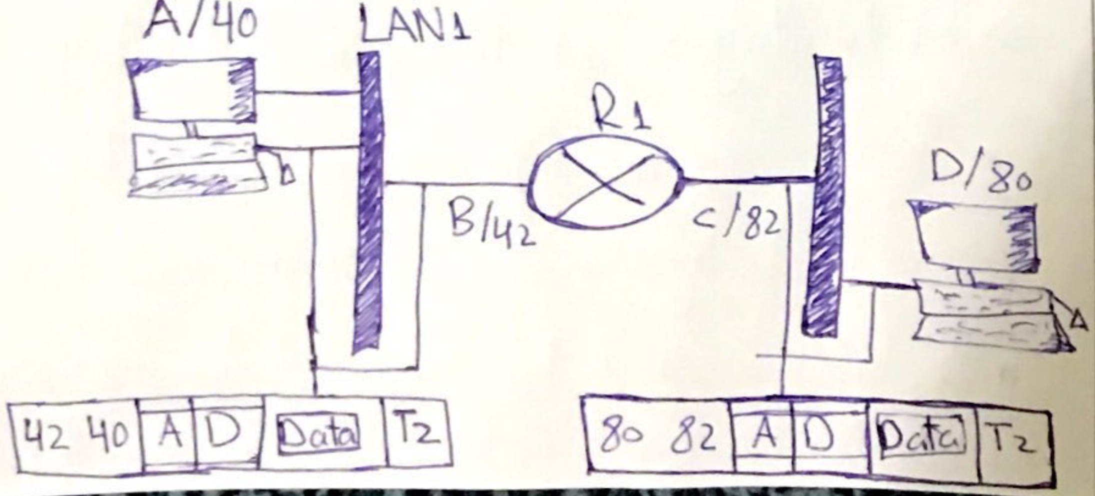
Subject : Intro, to telecomunication System

Q1 :- PART a). For figure below, computer A sends a message to Computer D via LAN1, router R_1 and LAN2. Assume that the communication is between a process running at computer A with port address i and a process running at computer D with port address j.
Show the contents of the packets and frames at network, data link and transport layer for each interface?

Figure :

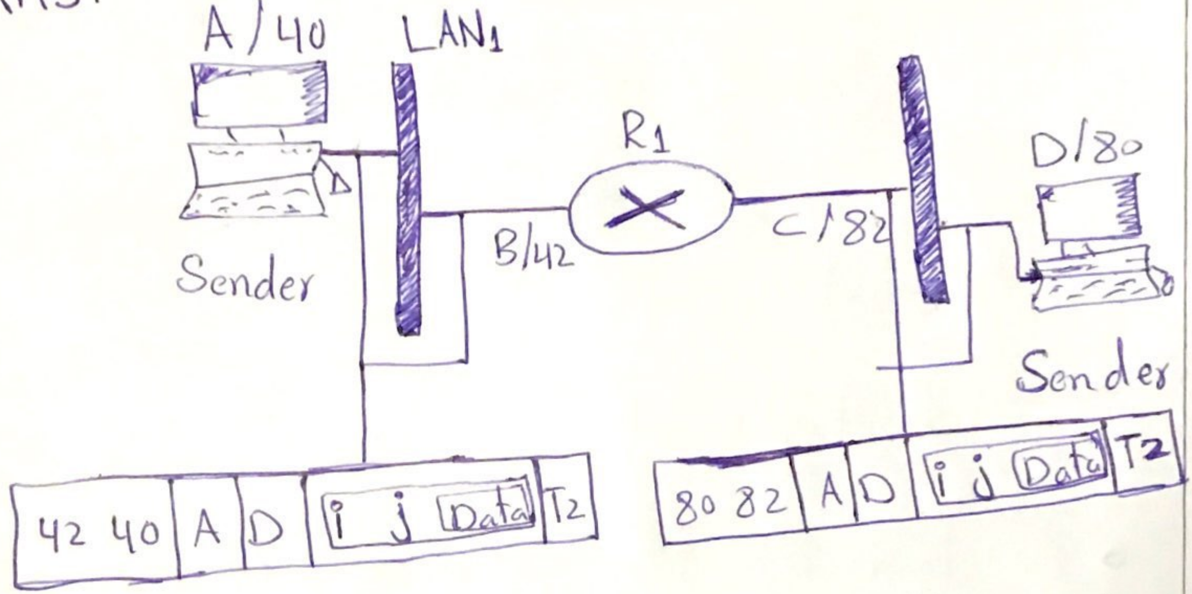


⇒ Answer :-



Assume that .... A with port address i ....
...... process running at computer D ..... j.

⇒ Ans:



Q#1 :- PART b) :- Discuss briefly the main responsibilities of each layer of OSI model?

⇒ Answer :-

The **OSI Model** (open System Interconnection model) is a conceptual framework used to describe the functions of a networking System.

The OSI model characterize computing functions into a universal set of rules and requirements in order to support interoperability between different Products and Software.

Responsibilities of Each OSI Model :

Responsibility of Host:

Layer	
Application	→ End User layer → HTTP, FTP, IRC, SSH, DNS
Presentation	→ Syntax layer → SSL, SSH, IMAP, FTP, MPEG, JPEG
Session	→ Synch & Send to port → API's, Sockets, winsock
Transport	→ End-to-end Connections → TCP, UDP.

Responsibility of Network:

Layer	
Network	→ Packets → ~~Ethernet, PPP, Switch, Bridge~~ IP, ICMP, IPSec.
Data Link	→ Frames → Ethernet, PPP, Switch, Bridge
Physical	→ Physical structure → Coax, Fiber, wireless, Hubs, Repeaters,

Q# 2 :- PART a). Given an amplifier with an effective noise tempreture of 11,000 k and a 12 MHz bandwidth. what thermal noise level, in dBW, may we expect at its output?

Answer :- Calculate Thermal Noise Level

T = Effective noise temperature = 11000 K

B = Bandwidth = 12 MHz

$= 12 \times 10^7$ Hz ($\because$ 1MHz $= 10^6$ Hz)

$= 10^{1+7}$ Hz ($\because (a^m \times a^n = a^{m+n})$

$B = 10^8$ Hz

k = Boltzmann's Constant $= 1.38 \times 11^{-23}$ J/K

Scanned with CamScanner

Q# 2: PART b):- What is the channel Capacity for a tele-printer channel with a 450-Hz bandwidth and a signal-to-noise ratio of 6dB, where the noise is white thermal noise?

Answer:-

From the given details we know,

B (Bandwidth) = 450 Hz

SNR_{db} (signal-to-noise ratio decibal) = 6dB.

Suppose, C = Channel Capacity and SNR = signal-to-noise ratio.

Now using decibel formula,

$SNRdb = 10 * \log (SNR)$

That means,

$6 = 10 * \log (SNR)$

$SNR = \log^{-1} 0.6$

$SNR = 10^{0.6}$

$SNR = 3.990$

Hence signal-to-noise ratio (SNR) = 3.990

Now using Shannon's equation.

$C = B * \log_2 (1+SNR)$

$C = 450 * \log_2 (1+3.990)$

$C = 450 * \log_2 (4.990)$

$C = 778.50$

Therefore, the channel capacity for teleprinter channel is 778.50 bits per second.

Scanned with CamScanner

Q# 2:- PART C):- Given a channel with and intended capacity of 22 Mbps, the bandwidth of the channel is 4 MHz. Assuming white thermal noise, What Signal-to-noise ratio is required to acheive this Capacity?

Answer:-

$$SNR_{dB} = 10 \log_{10} SNR$$

$$SNR = 10^{SNR_{dB}/10}$$

$$SNR = 10^{2.2}$$

$$SNR = 158$$

For Capacity

$$C = B \log_2 (1 + SNR)$$

$$C = 4 \times 10^6 \times \log_2 (158)$$

$$\boxed{C = 1.9 \text{ Mbps.}}$$

Q# 3:- PART a). A digital Signaling System is required to operate at 9600 bps. If a Signal element encodes a 8 bit word, what is the minimum required bandwidth of the Channel?

Answer:- Using Nyquist's equation

$$C = 2B \log_2 M$$

we have

$$C = 9600 \text{ bps}$$

$$C = 2B \log_2 M$$

$$9600 = 2B \times 8, \text{ and}$$

$$\boxed{B = 600 \text{ Hz}}$$

$$9600 = 2B \times 8$$

$$\frac{9600}{2 \times 8} = \frac{2B \times 8}{2 \times 8}$$

$$= \frac{9600}{16} = B$$

$$600 \text{ Hz} = B$$

Q# 3:- PART. b). If the received Signal level for a Particular digital System is -150 dBW and the receiver System effective temperature is 1700k, what is Eb/No for a link transmitting 2600 bps?

Answer:=> Eb/No

$$\left[\frac{E_b}{N_o}\right]_{dB} = S_{dBW} - 10\log R - 10\log k - 10\log T$$

$$= S_{dBW} - 10\log R + 150 dBW - 10\log T$$

- If a minimum Eb/No of 8.4dB is needed to acheive a bit error rate of 10^{-4}
- Given:
  - The effective noise tempreture, T, is 1700 k
  - The data rate, R, is 2400 bps

What is the minimum signal level required for the received Signal?

$$8.4 = S(dBW) - 10\log 2600 + 150\, dBW - 10\log 1700$$

$$= S(dBW) - (10)(3.41) + 150 - (10)(3.23)$$

$$\boxed{S = -151.3\ dBW}$$