MOD-1

1) Max N.O Users :- $\frac{\text{Link Rate}}{\text{Data Rate}}$

2) Throughput :- $\frac{(\text{Frame Rate}) \times (\text{N.O of bits in a frame})}{60}$

3) Attenuation = $10 \log_{10}\left(\frac{P_1}{P_2}\right)$

4) Channel Capacity = Bandwidth $* \log_2 (1 + SNR)$

5) $\lambda = \frac{V}{D}$ $\quad (THz = 10^{12})$

7) Propagation Delay (PD) = $\frac{\text{Distance}}{\text{Propagation Speed}}$

Transmission Delay (TD) = $\frac{\text{Packet Length}}{\text{Trasmission Rate}}$

Total Delay = PD + TD

8) Throughput = $\text{Min}(R_1, R_2, R_3)$

Time to transfer file = $\frac{\text{File Size}}{\text{Throughput}}$ (Bytes → Bits, kpbs → bit/sec)

9) Bandwidth Delay Product (BDP) = Bandwidth × PD

= Bandwidth × $\left(\frac{\text{Distance}}{\text{Speed}}\right)$

Max No. bits = BDP

Width of bit = $\frac{\text{length of link}}{BDP}$

Width = $\frac{m}{R \times \frac{m}{S}}$

Width = $\frac{S}{R}$

10) Propagation Time = $\frac{\text{Distance}}{\text{Propogation Speed}}$

Transmission Time = $\frac{\text{Message}}{\text{Bandwidth}}$

MCD-2

1) CRC :-

$x^3 + 1 = 1.x^3 + 0.x^2 + 0.x + 1 = 1001$

```
1001 ) 11001001000
       1001
       ----
        1011
        1001
        ----
         1000
         1001
```

Continue this

=> 111

2) For 1 station :-

Data Transfer = poll + 5(frame + ACK) (x 4)

Polling and NAK = poll + NAK (x 4)

=> Total activity = 8 polls + 20 Frames + 20 ACK + 4 NAK

3) CRC

Same as (1) (Add zeros = Number (P) - 1)

4) G = (N.O stations) x (Avg N.O of Frames)

Throughput(S) = $G \times e^{-2G}$ Frames/sec

$S \times \frac{\text{frame size}}{\text{channel capacity}}$ kbps

5) Given:-

d(a, b)

=> Find X-OR(a, b)

Hamming distance = Number of 1s

6) Same as 5

7) Find Even Parity bit

8) CRC (same as 1,3)

9) $n = 2^r - 1$ (codeword)

$k = n - r$ (codeword)

10) $S = G \cdot e^{-G}$

MOD-3

1) Slash Notation (/n):-
   -> Convert into Binary
   -> Count No of 1s.

2) Class B -> 128-191
   N.N.H.H
   Subnets = $2^6 = 64$

   Max Hosts = $2^{10} - 2 = 1022$

3) Find Class Using Class Table

4) Draw Connections

5) Target MAC Address :- FF:FF:FF:FF:FF:FF

6)

7) Data transmitted = Rate x Time

   Avg output data rate = $\frac{\text{Data}}{\text{Time}}$

8/9) Binary -> Dotted Dec, Dotted Dec -> Binary

10) Find Class.

MOD - 4

1) Throughput = (Packet side) x (Packet Rate)

= x 8 (for bits)

2) Payload Size = (Total packet size) - (TCP Header) - (IP Header)

N.o of fragments = ciel (payload/MTU)

1st → MTU - IP

2nd/3rd → MTU - IP - TCP

3) Diagram

4) Efficiency = $\frac{\text{Data size}}{\text{Total bytes}} \times 100$

UDP 5) → 06 82 00 0D 00 1C E2 17

source destination Total length

len = Total - 8 (Hsize)

→ convert Hexa → Dec

→ 65535 - Ip (H) - UDP (H) = Max data length (UDP)

6) Diagram

UDP 7) 0045DF0000580000

a, b, c d → same as 5

TCP 8) E293 0017 00000001 00000000 5002 07FF

source destination Seq num Ack num 5 size=4 window size

5 × 4 = 20 header length

5002 → convert → 0101 0000 0000 0010

URG ACK PSH RST SYN FIN

9) TCP

$$\text{Throughput} = \frac{\text{Window Size}}{\text{RTT}}$$

Part B

17) $$\text{Throughput} = \frac{\text{Window Size}}{\text{RTT}}$$ (msec = 0.01 sec)

$$\text{Line efficiency} = \frac{\text{Throughput}}{\text{channel capacity}}$$

MOD-V

1) FQDN → Fully Qualified Domain Name
xx.yy.net
www.iare.net
PQDN → Partially Qualified Domain Name
Mil, Edu, iare

3) FF FB 01 FF F4
FF FE 01 FF F9

FF → Telnet
FB → Will
FE → DO
01 → option code for option being generated
F4 → Interrupt Process
F9 → Negotiate About Window size.

4) 11110011 0XF3
00111100 ⇒ ASCII 0X3C
11111111 0XFF
(0x → Prefix)

5) Same as 1