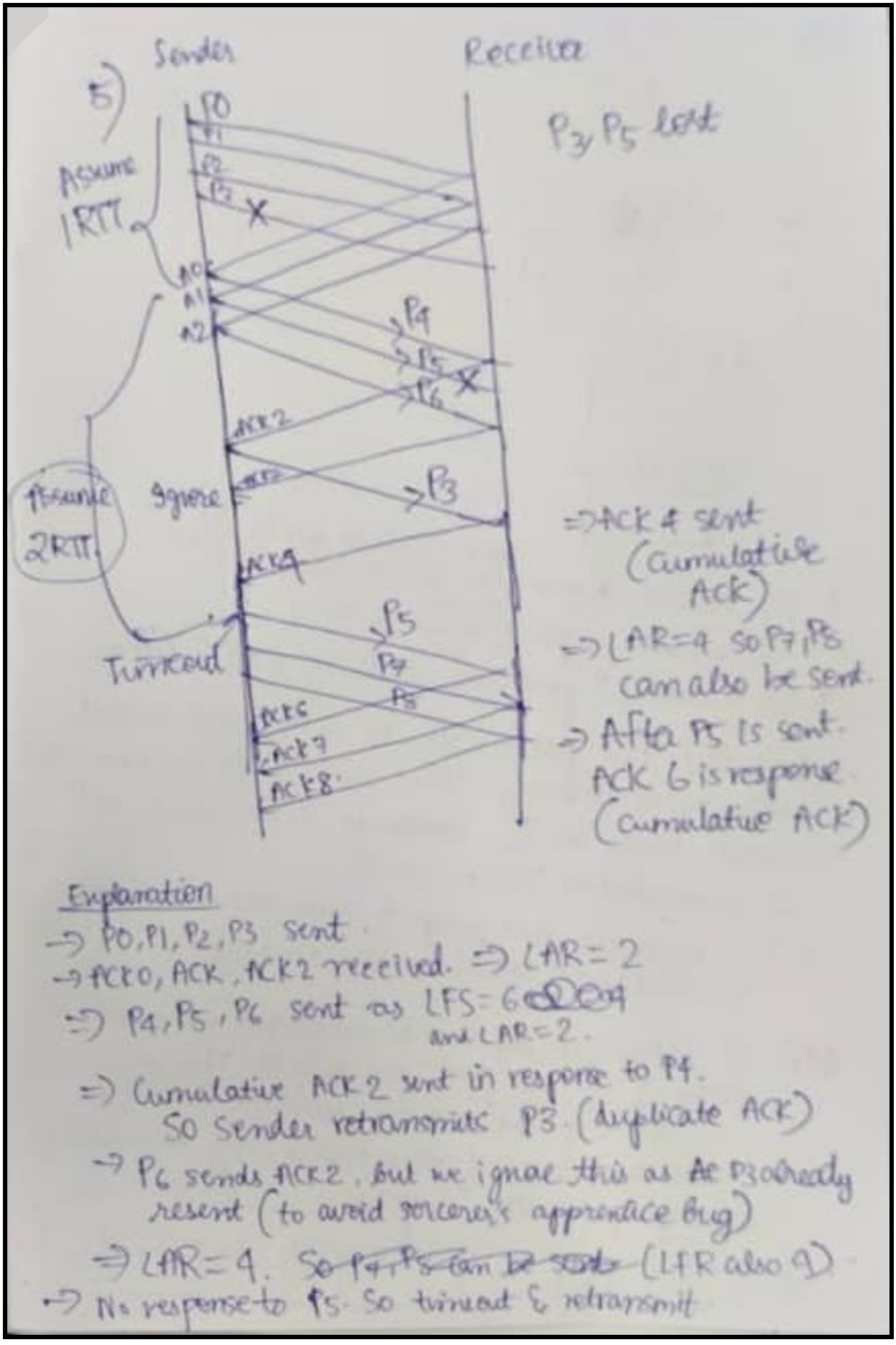
Midsem

1. Short Answer Questions: Other than auto-graded questions, rest all require brief and to the point explanations. No marks for answers without explanation. This applies to the entire paper.
    a. 13.12
    d = 1500 * 8 bits / 6 Mbps + 0.001 s + 1500 * 8 bits / 100 Mbps + 0.01 s = 13.12ms
    b. 15
    Shannon limit C = B log_2 (1 + S/N); 4 Mbps = 1 MHz * log_2 (1 + S/N); S/N = 15
    c. To detect 2 errors we need a hamming distance of 3 : 10 00 11 or 000111 (basically anything that differs from other in at least 3 places)
    d. Yes. Since there are only 16 legal code words (2^4), but 32 (2^5) possible received sequences, so it can detect (some) errors.
    e. 640 bytes (5120 bits) since Fast Ethernet is 10 times faster.
    f. User is getting 1 slot every 40 slots. Rate is 1/40 * 10Mbps = 250kbps
    g. Ethernet padding can add extra zeros to the frame(To meet the required minimum frame size). o, unless you know the total length, you cannot truncate at the right point. Note that data can contain zeros.
    h. >=20
    Tx-time = frame-size/(data-rate=4kbps) Efficiency = Tx-time/ (Tx-time + 40ms) >= 0.5. frame-size >= 20 bytes
    i. Inport, In-vci, Outport, Out-vci

2.



Explanation

=> P0, P1, P2, P3 sent

=> ACK0, ACK1, ACK2 received. => LAR = 2

=> P4, P5, P6 sent as LFS = 6 and LAR = 2.

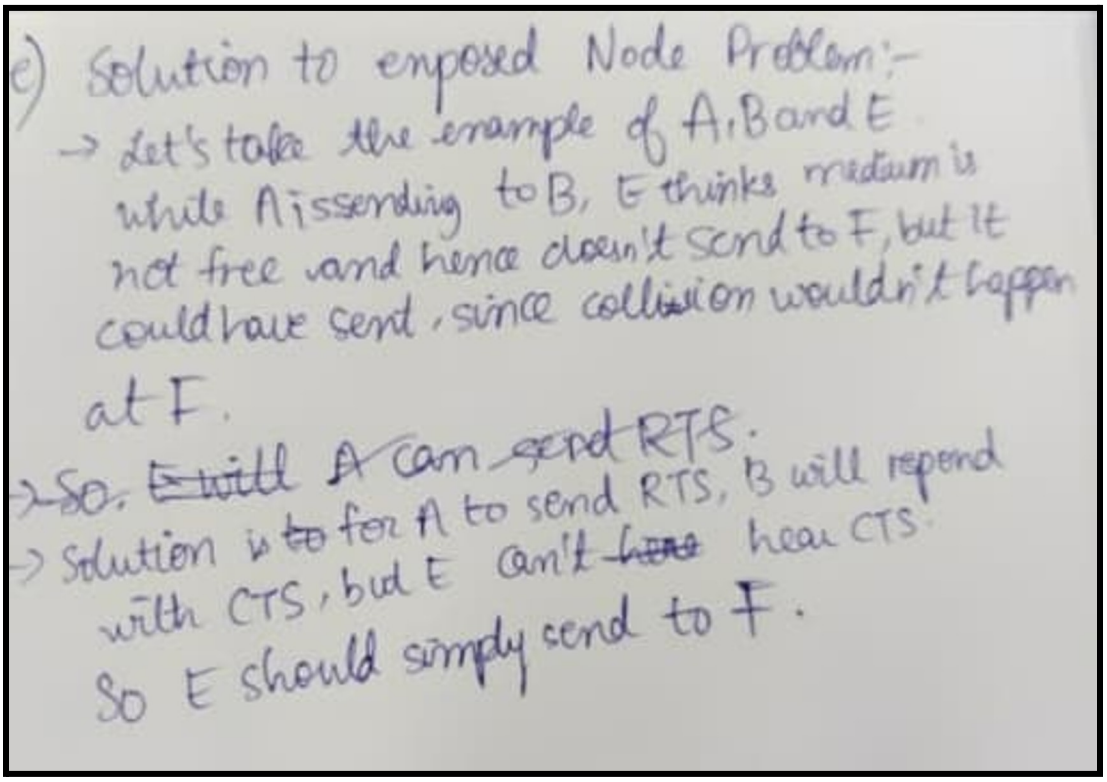
=> Cumulative ACK 2 sent in response to P4. So Sender retransmits P3 (duplicate ACK)

=> P6 sends ACK 2, but we ignore this as we P3 already resent (to avoid sorcerer's apprentice bug)

=> LAR = 4. So ~~P7, P8 can be sent~~ (LFR also 9)

=> No response to P5. So timeout & retransmit

3.

a. C, F
b. E
c. D
d. A, F
e. 

4.

a. 2, 3, 4
b. 2, 3, 4
c. 1, 2, 3
d. 1
e. 1, 2, 4
f. Drop

5.

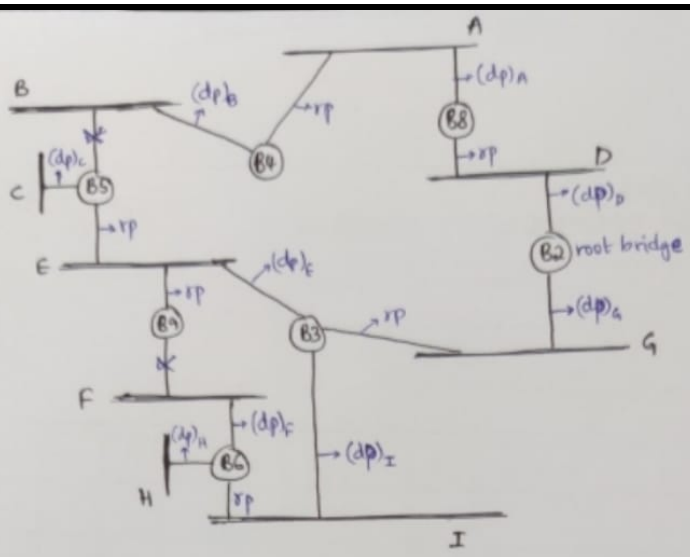
a. (R:Red, B: Blue, G: Green, Y: Yellow)
   S1: need 4 ports (R to S2, R to S3, B to S2 and Y to S3)
   S2: 2 ports (R to S1, B to S1)
   S3: 2 ports (R to S1, Y to S1)
   Note in above, S1 interconnects S2 and S3 above.

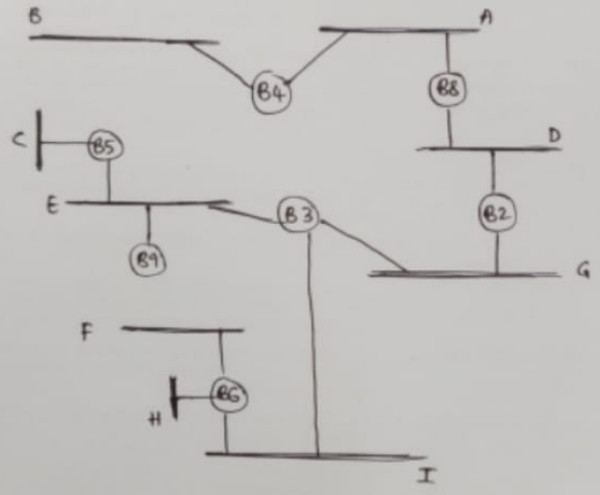
S2 can be used to interconnect S1 and S3 also, but here you will need total of 10 ports which is inefficient. S1 needs 3 ports to S2: R, B, Y; S2 needs 3 ports to S1: R, B, Y and 2 ports towards S3: R, Y; S3 needs 2 ports towards S2; R and Y. Similar logic if S3 is interconnecting S1 and S2, it also requires 10 ports.

b. S1: 2 ports (one to S2 marked R/B and one to S3 marked R/Y)
   S2: one port to S1marked R/B
   S3: one port to S1 marked R/Y

6.

Q1.





1. designated port : Port connecting LAN segment and bridge such that the bridge provides shortest path to root bridge (smaller id to break ties)

LAN segments

A : A-B8 (A-B4 path longer)

B : B-B4 (B-B5 also a case, but smaller sending bridge id wins)

C : C-B5

D : D-B2 (directly connected to root bridge through this port)

E : E-B3 (E-B5 and E-B9 long paths)

F : F-B6 (F-B9 also a case, but B6 has smaller id)

G : G-B2 (direct connection to root bridge)

H : H-B6

I : I-B3 (shortest path is this only)

2. Root ports: (for each bridge) port through which we have shortest path to root bridge (smaller id to break ties)

for B3, B3-G
for B4, B4-A
for B5, B5-E
for B6, B6-I
for B8, B8-D
for B9, B9-E

} shortest path checking, didn't come across any ties also

3. Disabled ports: we disable all the ports that are neither root ports nor designated ports

(B5-B), (B9-F)