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Subject Code: SEHH2238

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Lecture Group: 202

## SEHH2238 Computer Networking Mid-term Test – Answer Sheet

### Instruction to Students:

1. **Answer ALL questions.**
2. Fill your personal particulars in the header of this answer sheet.
3. Insert your answer into the space provided in this answer sheet.
4. Show your work clearly and neatly. Marks will be deducted for untidy work.
5. Upon completion, save a copy of this file into **PDF file format**.
6. **Upload the PDF file** to the submission link on Moodle within the **15-minute submission grace period**.

### Important:

Ensure the originality of your work. Any form of plagiarism is subject to disciplinary actions such as mark deduction, disqualification or even expulsion by the College.

*(Please refer to the relevant section(s) on plagiarism of the Student Handbook.)*

For Markers Only	
Question	Mark
1	
2	
3	
4	
Total	

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## Answer for Question 1

**/25**

A)

Total power change =  $-0.6 * 16 = -9.6\text{dB}$

We have:

$$-9.6 = 10 \log_{10} (0.5644/P_1)$$

$$P_1 = 5.1474 \text{ mW (4 d.p.)}$$

B)

Max data rate = 24Kbps

Bandwidth = 13kHz

Using the Shannon Capacity equation, we have:

$$24 * 1000 = 13 * 1000 * \log_2(1 + \text{SNR})$$

$$24/13 = \log_2(1 + \text{SNR})$$

$$\text{SNR} = 2.5954 \text{ (4 d.p.)}$$

By applying SNR equation:

$$\text{SNR} = P_1 / \text{Noise}$$

$$\text{Noise} = P_1 / \text{SNR} = 1.9833 \text{ (4 d.p.)}$$

C)

Distortion may be one of the factors altering the signal, it changes its form or shape. Distortion can be caused by the difference in delay of different frequency components.

D)

i)

“W” and “4” in 7-bit ASCII, presented in binary:

“W” = 1010111, “4” = 0110100

Data word of “W4”: 1010111 0110100

ii)

Zero added dataword: 101011101101000000

Polynomial is: 10100

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10001101101111  
10100 | 101011101101000000

10100

00011

00000

00111

00000

01110

00000

11101

10100

10011

10100

01110

00000

11101

10100

10010

10100

01100

00000

11000

10100

11000

10100

11000

10100

11000

10100

1100

remainder is: 1100

codeword is: 101011101101001100

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## Answer for Question 2

**/25**

A)

The sender sends one frame and waits for an ACK before sending the next frame  
If no ACK is received after timeout, the sender retransmits the frame

B)

Transmission time of the data frame:

$$900/1.2\text{M} = 750 \mu\text{s}$$

ACK transmission time = 0

Propagation time:

$$(2000 * 1000)/(1.3 \times 10^8) = 15.384615 \text{ ms}$$

$$\text{Total delay of sending a frame} = 750 \mu\text{s} + 0 + 15.384615\text{ms} * 2 = 31.5192 \text{ ms}$$

C)

Total frame of 900bit = 1777

Last frame size = 700 bit

For the first 1777 frames, delay:

$$31.5192 \text{ ms} * 1777 = 56.0096 \text{ s}$$

For the last frame, delay =

$$T_p: 700/1.2\text{M} = 583.3333 \mu\text{s}$$

$$583.3333 \mu\text{s} + 0 + 15.384615\text{ms} * 2 = 31.35256 \text{ ms}$$

$$\text{Total delay of 1.6Mb} = 56.0096 \text{ s} + 31.35256 \text{ ms} = 56.0410\text{s (4d.p.)}$$

D)

In 1777 frames, there are  $\lfloor 1777 / 10 \rfloor \times 1 = 177$  lost, and 7 frames remaining

In 184 frames, there are  $\lfloor 184 / 10 \rfloor \times 1 = 18$  lost, and 4 frames remaining

In 22 frames, there are  $\lfloor 22 / 10 \rfloor \times 1 = 2$  lost, and 2 frames remaining

In  $2 + 2 = 4$  frames < 10 frames, no lost happens

No. of frame lost = 197

$$\text{Total delay} = 56.0410\text{s} + 130\text{ms} * 197 = 81.6510\text{s}$$

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### Answer for Question 3

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A)

For non-persistent, stations backoff when it senses the channel is busy

For 1-persistent, stations keep sensing the availability of the channel, if it is free, send the data.

B)

i)

ii)

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### Answer for Question 4

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A)

i)

11111111.11111111.11000000.000000

255.255.192.0

ii)

10.121.128.0

00001010.01111001.10 000000.00000000

iii)

10.121.191.255

00001010.01111001.10 111111.11111111

iv)

10.121.128.1 to 10.121.191.254

B)

500 bit transmission time:

$$500/2M = 250 \mu s$$

$$\text{Propagation time} = 4000 \times 1000 / 2 \times 10^8 = 0.02s$$

90000 bit transmission time:

$$90000/2M = 0.045s$$

$$\text{Total delay} = (250 \mu s + 0.02s) \times 2 + (0.045s + 0.02s) + (250 \mu s + 0.02s) \times 3 = 0.1625s$$