KING SAUD UNIVERSITY COLLEGE OF COMPUTER AND INFORMATION SCIENCES COMPUTER SCIENCE DEPARTMENT		
CSC 329: Computer Network	**Tutorial 2**	**2nd Semester 1440**
Name:	**Student ID:**	

Part1: Multiple-Choice Questions (Model Answer)

1) **Which of following is not a guided computer communication media?**
   a. twisted pair cables
   b. fiber optic cables
   c. coaxial cables
   d. satellite

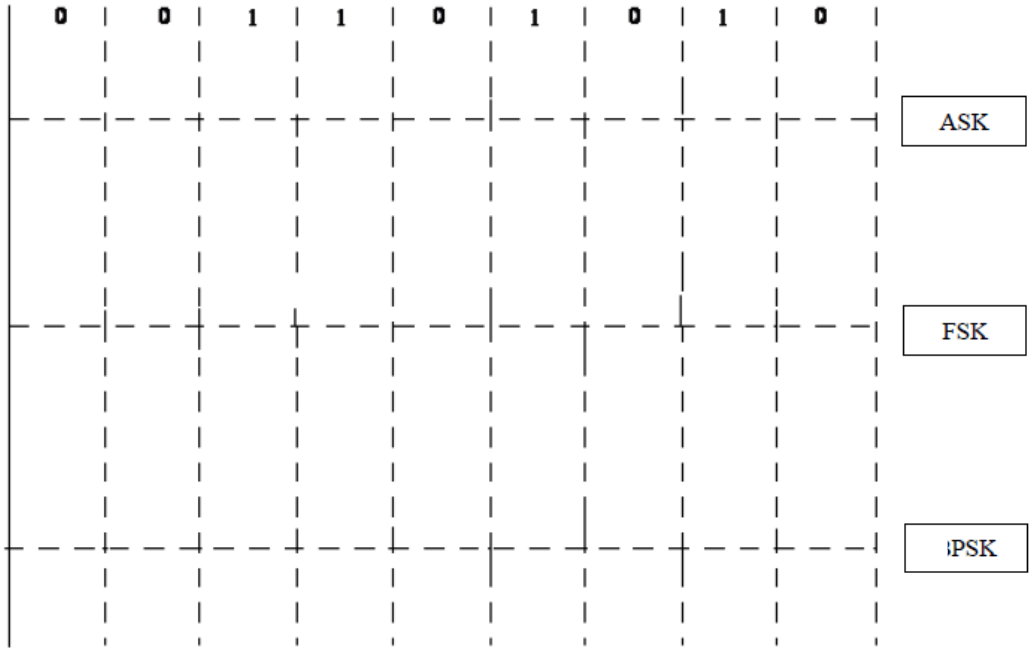
2) **_____ encoding has a transition at the middle of each bit.**
   a .NRZ
   b. Manchester
   c. NRZ-I
   d. All the above

3) **Modulation of an analog signal can be accomplished through changing the_____ of the carrier signal.**
   a. Amplitude
   b. Frequency
   c. Phase
   d. Any of the above

4) **ASK, PSK, and FSK are examples of _____ modulation.**
   a. Digital-to-digital
   b. Digital-to-analog
   c. Analog-to-analog
   d. Analog-to-digital

Part2: Exercises

1) Draw the bit sequence **"001101010"**using the following types of digital modulation: ASK, FSK and PSK. Note: Use the below coordinate system.



ASK: only amplitude changes for each bit. Phase shift and frequency are the same.
FSK: only frequency changes for each bit. Phase shift and amplitude are the same.
PSK: only phase shift changes for each bit. Amplitude and frequency are the same.

2) A signal travels from point 1 to point 4. At point 1, the signal power is **120 W**. The signal is attenuated by the time it reaches point 2, the power becomes **80w**.

a) Calculate the total relative power in dB?

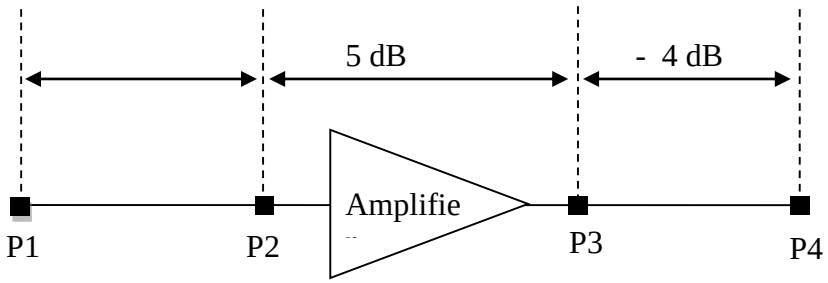
Attenuation = $10\log_{10}$ *80/120*
Attenuation = $10\log_{10}$ *(0.667)*
Attenuation = -1.8= -2dB
The total relative power= -2 +5 - 4= -1 dB

b) If the power is gained or loss?

Loss

c) What is the signal power in point 4.

Attenuation = $10\log_{10}$ *P4/P1*
-1 = 10 $\log_{10}$ *P4/120*
-0.1= $\log_{10}$ *P4/120*
$10^{-0.1}$ =P4/120
0.8=P4/120
P4=95.3 watt



3) We have a channel with **4 KHz** bandwidth. If we want to send data at **100 Kbps**, what is the minimum SNR^{db} ? What is SNR?

Capacity = bandwidth * $\log_2$ (1 +SNR)
$\log_2$ (1 +SNR) = Capacity / bandwidth
= 100 * 10^3 / 4 * 10^3
= 25
SNR = 2^{25} -1
SNR_{dB} = 10 *$\log_{10}$ (2^{25} -1) =75.25

4) What is the total delay (latency) for a frame of **size 5 million bits** that is being sent on a link with **5 routers** each having a **queuing time of 2 µs**. The **length of the link is 2000 Km**. The speed of light inside the link is **2 × 10^8 m/s**. The link has a **bandwidth of 5 Mbps**. Ignore processing time at the nodes. Which component of the total delay is dominant?

Latency = processing time + queuing time +transmission time + propagation time
Processing time = 0
Queuing time = 5 × 2 µs = 10 µs = **0.000010 s**
Transmission time = 5,000,000 / (5 Mbps) = **1 s**
Propagation time = (2000 Km) / (2 × 10^8) = **0.01 s**
Latency = 0 + 0.000010 + 1 + 0.01 = 1.010030 s