**ECE 23**

**QUIZ 7**

Error coding schemes are divided into what two broad categories? **(block and convolution)**

Which of the different ARQ protocol uses a frame buffer to store subsequent frames, instead of discarding it. **(Selective Repeat ARQ)**

In this error correction procedure, the receiver is responsible for correcting the error, without the need for retransmission. **(forward error correction)**

Using LRC and VRC, the parity check code can detect what type of bit errors? **(single bit errors)**

Among the error detection codes listed below, which is among them is the most basic and most primitive? **(Repetition codes)**

Checksums are calculated using what type of binary arithmetic? **(one's complement)**

If we use cyclic redundancy checks for error detection, the resulting CRC in the binary polynomial division process is \_\_\_\_\_\_\_? **(dependent on the number of bits in the remainder)**

When using Hamming Codes, how many parity bits are needed to be added if the message to be transmitted is 12-bits wide? **(4 parity bits)**

In performing modulo-2 arithmetic in CRC calculations, especially in polynomial division, what processes give the same result? **(addition and subtraction)**

In block coding, if n=3, what is the maximum possible Hamming distance between the transmitted and the received code words?  (n = number of transmitted bits) **(3)**

**QUIZ 8**

1. What does the acronym below stand for? MUMIMO **(Multi-User, Multiple Input, Multiple Output)**
2. Calculate the maximum theoretical download speed of the ADSL2+ Standard if the Signal-to-Noise ratio is +30dB assuming ADSL2 + downstream bandwidth is approximately 2 kHz. **(20Mbps)**
3. Which digital modulation technique is NOT utilized by the Wi-Fi 4G standard? **(8-QAM)**
4. Who is the author of the paper entitled "Certain Factors Affecting Telegraph Speed" which discusses that the type of signal and choice of codes will determine the maximum speed of a telegraph system. **(Harry Nyquist)**
5. For the 802.11ax Wi-Fi standard, how many constellation points are needed in the digital modulation scheme to be used in order to achieve the maximum theoretical speed. **(1024)**
6. A source generates four messages M1, M2, M3 and M4, with probabilities of 0.5, 0.25, 0.15, and 0.10 respectively. The messages are generated independently of each other. A source coder assigns codes to each message. Calculate the value of the entropy for this system. **(H = 1.74)**
7. The channel capacity of a noise-free communication channel having M symbols is given by **(log2M)**
8. What amount of information is contained in the 0’s if a a binary stream source outputs 0's three times as often as 1's? **(2.15 bit)**
9. A standard telephone circuit has a bandwidth of 3000 Hz. Compute for the Nyquist theoretical maximum channel capacity using 64-QAM. **(36 kbps)**
10. Two sources, S1 and S2 are both transmitting symbols where each have equal probabilities. S2 transmits 4 different symbols, while S1 transmits 16 different symbols. What is the relationship of the entropy for both sources? **(The entropy of S1 is less than the entropy of S2.)**
11. What is the channel capacity of a noisy communication system in bits per second, given the following: BW = 4 kHz S/N = 255 **(32,000)**
12. A pregnant mother was in the emergency room in a hospital together with the attending physician.

The father is nervously waiting outside for news about the condition of his family.

Several minutes after delivering the baby the Doctor came out of the room, and spoke to the father in a calm manner.

The Doctor sadly told the father, "Your wife and baby did not survive"

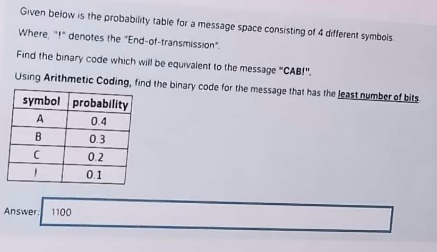
With knowledge on Information Theory, how much information was given by the Doctor to the father? **(1.0 bit of information)**

1. Calculate the average amount of information for each character (or letter) in the Filipino alphabet. Assuming that each of the 28 characters has an equal likelihood of occurrence in any word and neglecting spaces and punctuations. **(4.81)**
2. What are the frequency band/s used by a Tri-band router? **(2.4 GHz and 5.0 GHz bands)**
3. Identify the person shown in the picture below **(Claude Shannon)**



1. What is the maximum entropy that can be obtained for transmitting 10 different symbols with equal probabilities? **(0.10)**
2. An old long distance communication system utilizes a total bandwidth of 8 MHz This old system uses 32-QAM for digital transmission. It is proposed that system will be upgraded to a 128-QAM system. Theoretically, what is the expected gain of new channel capacity? Assume the same bandwidth will be utilized by the new system. **(up to 40% faster)**
3. This term is used to quantify the amount of uncertainty involved in the value of a random variable or the outcome of a random process. **(Entropy)**

**QUIZ 9**

1. Which type of encryption algorithm uses both a public key and a private key? **(DSA)**
2. This term refers to the maximum a posteriori probability (MAP) estimates of the most likely sequence of hidden states that can be obtained when using the Viterbi algorithm. **(Viterbi Path)**
3. Which of the following is NOT a fundamental Type or Classification of coding schemes? **(Hash Coding)**
4. Identify the person shown in the picture below. **(Alan Turing)**
5. What technique or method is most commonly used to decode the received messages that were encoded using convolutional codes or Trellis Coded Modulation? **(Viterbi Algorithm)**
6. This term refers to the field of study and practice of secure communications techniques that allow only the sender and intended recipient of the 'data" or 'message" to view the contents of a certain message. **(Cryptography)**
7. In the GSM mobile security management, what encryption algorithm is used to produce the SRES (signed response) output data, given the authentication key (Ki) and the Rand? **(A3 Algorithm)**
8. These are the three encryption algorithms commonly used in the GSM standard for mobile communications. **(A3, A5, and A8 algorithms)**
9. The most famous asymmetric encryption algorithm known as RSA Algorithm was invented in 1978 by: **(Adi Shamir, Leonard Adleman, Ron Rivest)**
10. This encryption technique was developed by IBM in the early 19705 and has a key length of 56-bits. **(DES)**
11. When constructing the code tree to be used for decoding a TCM received message, what convention do we use to properly construct the code tree? **(move-up for a “0” or move-down for a “1”)**
12. 
13. 