**IQRA NATIONAL UNIVERSITY, PESHAWAR, PAKISTAN**

**NETWORKS MANAGEMENT**

**Program: MSCS/PhDCS** **FINAL-TERM EXAM** **Semester: Spring 2020**

**Maximum Marks: 50** **Time Allowed: 6 Hours**

Q1. Select the correct answer of the given ones. (10)

1) Interactive transmission of data independent of a time sharing system may be best suited to

(a) Simplex lines (b) half-duplex lines (c) full-duplex lines (d) biflex lines

2) The loss in the signal power as of an Electromagnetic signal is called

(a) Attenuation (b) propagation (c) scattering (d) interruption

3) Early detection of packet losses improves _____ acknowledgment performance.

(a) odd (b) even (c) positive (d) negative

4) Additional signal introduced in the desired signal in producing hypes is called

(a) fading (b) noise

(c) scattering (d) dispersion

5) Token is a **Klingon** that rotates around the ring.

6) Ring may have up to _____ (802.5) or _____ (IBM) nodes.

7) FDDI can support a maximum of **500** stations.

8) Error-correcting codes are **probably not** enough to handle all errors.

9) ACK is a small **Controol frame** confirming reception of an earlier frame

10) Electronics **are very Fast** as compared to optics

**Q2: Distinguish between error correction and error detection. Explain any two error detection techniques with mathematical examples other than given in slides, search from internet.**

Answer:

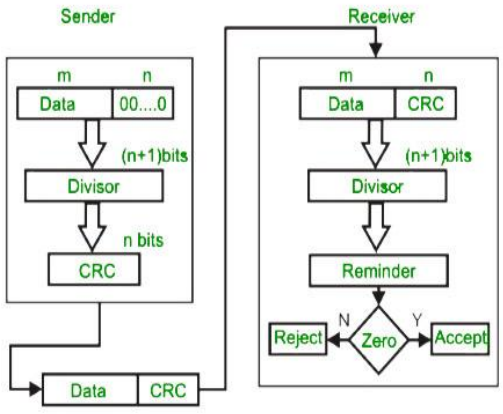
**Error correction and error detection:**

We can define the error correction is adding enough redundant bits to deduce what the correct bits are such as error correction are too expensive and hard.

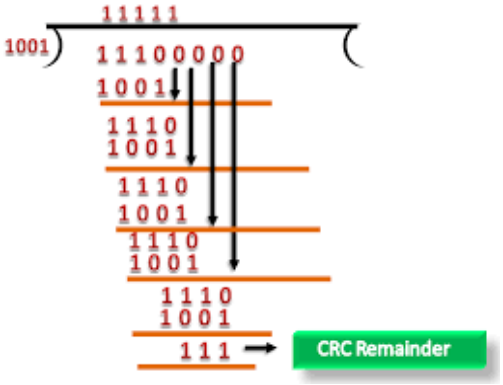
Also the error detection is that, error detection refers to a class of techniques for detecting garbled messages such as adding some extra bits to detect occurrence of error not enough to detect the position of errors.

| Error Detection | Error Correction |
|---|---|
| 1. **The receiver receives 011 which is a valid code word. The receiver extracts the data word 01 from it.** | The sender creates the code word 01011. The code word is corrupted during transmit ion, and 01001 is received. Receiver finds an error has occurred, assuming that there is only one bit corrupted. |
| 2. **The cod word is corrupted during the transition, and 111 is received. This is not a valid code word and is discarded.** | Comparing the received cod word with 1st cod word with the 1st cod word in the table (01001 versus 00000) the receiver decides that the 1st code word is not the one that was sent because there are 2 different bits. ( the same for 3rd or 4th one in the table) |
| 3. **The code word is corrupted during transmit ion, and 000 is received. Incorrectly extracts the data word 00.. Two corruption bits have made the error undetectable.** | The original code word must be the 2nd one in the table because this is the only one that differs from the received code word by 1 bit. |

| Data words | Code words |
|---|---|
| (x) | (xx) |
| 01 | 011 |
| 10 | 101 |
| 11 | 110 |



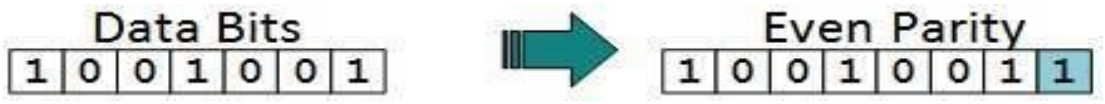

| Data word | Code word |
|---|---|
| (x) | (xxxx) |
| 01 | 01011 |
| 10 | 10101 |
| 11 | 11110 |



**Parity Check**

One extra bit is sent along with the original bits to make number of 1s either even in case of even parity, or odd in case of odd parity.

The sender while creating a frame counts the number of 1s in it. For example, if even parity is used and number of 1s is even then one bit with value 0 is added. This way number of 1s remains even.If the number of 1s is odd, to make it even a bit with value 1 is added.

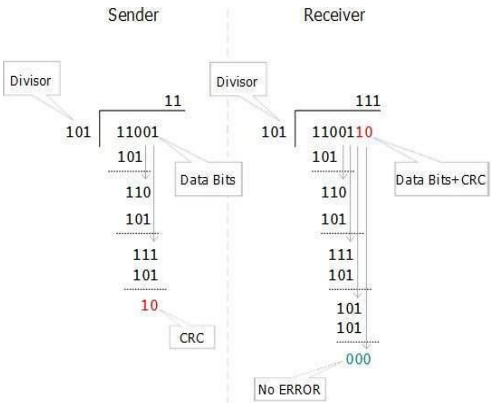



The receiver simply counts the number of 1s in a frame. If the count of 1s is even and even parity is used, the frame is considered to be not-corrupted and is accepted. If the count of 1s is odd and odd parity is used, the frame is still not corrupted.

If a single bit flips in transit, the receiver can detect it by counting the number of 1s. But when more than one bits are error nous, then it is very hard for the receiver to detect the error.

**Cyclic Redundancy Check (CRC)**

CRC is a different approach to detect if the received frame contains valid data. This technique involves binary division of the data bits being sent. The divisor is generated using polynomials. The sender performs a division operation on the bits being sent and calculates the remainder. Before sending the actual bits, the sender adds the remainder at the end of the actual bits. Actual data bits plus the remainder is called a codeword. The sender transmits data bits as codewords.




At the other end, the receiver performs division operation on codewords using the same CRC divisor. If the remainder contains all zeros the data bits are accepted, otherwise it is considered as there some data corruption occurred in transit.

In the digital world, error correction can be done in two ways:

- **Backward Error Correction** When the receiver detects an error in the data received, it requests back the sender to retransmit the data unit.
- **Forward Error Correction** When the receiver detects some error in the data received, it executes error-correcting code, which helps it to auto-recover and to correct some kinds of errors.

The first one, Backward Error Correction, is simple and can only be efficiently used where retransmitting is not expensive. For example, fiber optics. But in case of wireless transmission retransmitting may cost too much. In the latter case, Forward Error Correction is used.

To correct the error in data frame, the receiver must know exactly which bit in the frame is corrupted. To locate the bit in error, redundant bits are used as parity bits for error detection. For example, we take ASCII words (7 bits data), then there could be 8 kind of information we need: first seven bits to tell us which bit is error and one more bit to tell that there is no error.

For m data bits, r redundant bits are used. r bits can provide 2r combinations of information. In m+r bit code word, there is possibility that the r bits themselves may get corrupted. So the number of r bits used must inform about m+r bit locations plus no-error information, i.e. m+r+1.

Original Data

| 10011001 | 11100010 | 00100100 | 10000100 |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

k=4, m=8

Sender

```
1   10011001
2   11100010
    --------
   (1)01111011
          1
    --------
    01111100
3   00100100
    --------
    10100000
4   10000100
    --------
   (1)00100100
          1
    --------
Sum: 00100101
```

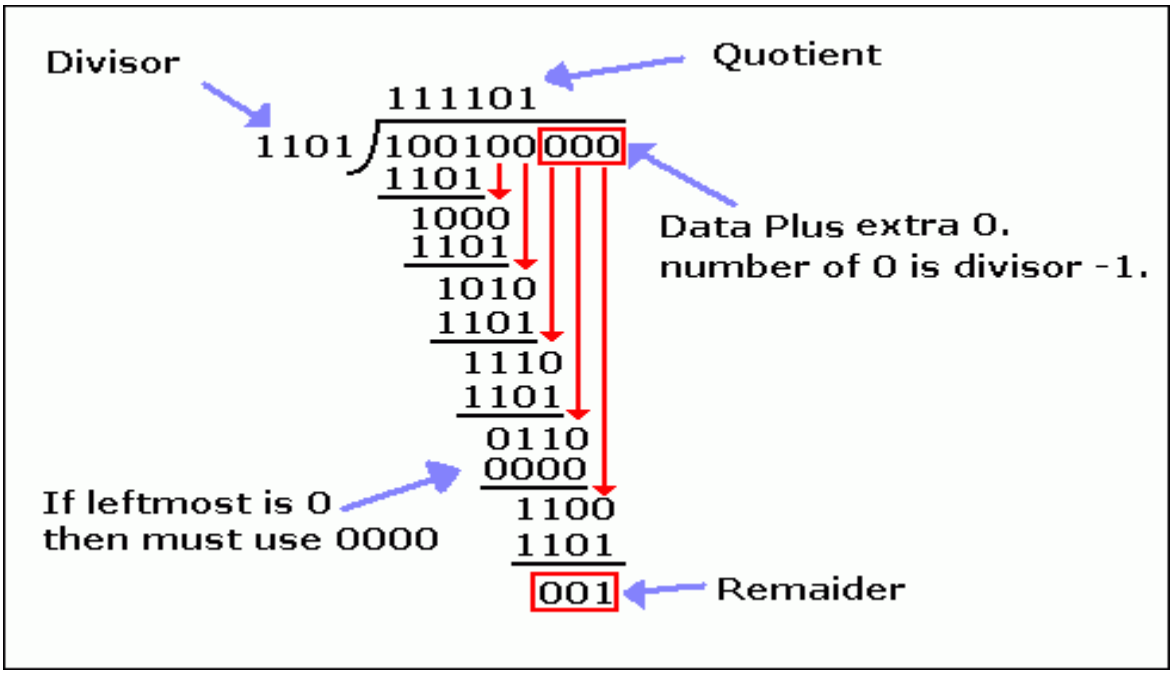
CheckSum: 11011010

Reciever

```
1   10011001
2   11100010
    --------
   (1)01111011
          1
    --------
    01111100
3   00100100
    --------
    10100000
4   10000100
    --------
   (1)00100100
          1
    --------
    00100101
    11011010
    --------
Sum: 11111111
```

Complement: 00000000

Conclusion: Accept Data



**Q.3 What is encoding? Write down different types of encoding. Explain characteristics of AM, FM and PM with mathematical equations**.

Answer:

**Encoding:** the definition of encoding is that the secured transmit ion of data in computer technology.

**Type of encoding:** the following is the different type of encoding,

- HTML **Encoding**.
- URL **Encoding**.
- Unicode **Encoding**.
- Base64 **Encoding**.
- Hex **Encoding**.

The explaintionand and characteristics of AM, FM and PM with mathematical equations.

Amplitude modulation:

It may be define as a a system in which max amplitude of the carries wave is made proportions to the instaneous of the value of amplitude of modulating signal.

Modulating = m(t)= Am os wmt

Carrier=c(t)= Ac 10 s w c t

Am= ax.Amplituade of modulating signal.

Ac= Amplitude------- carrier

Wm=2πf= fm= Wm /π

Wc=2πfc fm=Wc/2π\

M(0= AmcosWmt

C(t)= Acos wct

S(t)=A+m(t)cosWct

Amplitude modulation signal

Envelop of Am=[A+m(t)=E(t)

= 5(t)=E(t)cos wct

**Frequency modulation (FM) :**

The definition of Frequency modulation (FM) is a technique used to encode data on an alternating digital or analog signal. The method includes varying the frequency of the carrier wave on which useful information is imposed or impressed upon that is called the FM.

(FM) wave is most readily

$$x_c(t) = A_c \cos\left[\omega_c t + 2\pi k_f \int_{-\infty}^{t} x(\lambda)d\lambda\right]$$

The instantaneous angle, (J( t ) , of the above cosine wave is the value in the brackets,

$$\theta(t) = \omega_c t + 2\pi k_f \int_{-\infty}^{t} x(\lambda)d\lambda$$

The derivative of ***q ( t )*** is the instantaneous radian frequency ***w ( t )*** of the FM signal. Dividing that by **2*p*** produces the instantaneous frequency ***f ( t )***, given by

$$f(t) = \frac{1}{2\pi}\frac{d\theta(t)}{dt} = f_c + k_f x(t)$$

It is now clear that the instantaneous frequency of the FM signal varies around the carrier frequency $f_c$ by an amount $k_f x(t)$, where $k_f$ is the modulation constant. Positive values of ***x ( t )*** produce increases in ***f ( t )***, whereas negative values of ***x ( t )*** produce decreases in ***f ( t )***. If ***x ( t )*** is restricted by

$$|x(t)| \leq x_{max}$$

then the frequency of the FM wave varies around $f_c$ by $\pm k_f x_{max}$ This is the reason that $k_f x_{max}$ is referred to as the ***maximum frequency deviation of the FM wave***

$$(\Delta f)_{max} = k_f x_{max}$$

It is nearly impossible to find the spectrum of an FM wave except for special waveforms of ***x ( t )***. The simplest is the sinusoidal case, given by

$$x(t) = A_m \cos w_m t$$

and we observe that for this sinusoid $x_{max} = A_m$, hence the maximum frequency deviation in this case is

$$(\Delta f)_{max} = k_f A_m \qquad (2.7)$$

For this modulating waveform, (2.1) becomes

$$x_c(t) = A_c \cos\left(\omega_c t + \frac{k_f}{f_m} A_m \sin \omega_m t\right)$$

The notation can be simplified by defining

$$\beta = \frac{k_f}{f_m} A_m \qquad (2.9)$$

so that

$$x_c(t) = A_c \cos(w_c t + b \sin w_m t)$$

## Phase modulation (PM)

The d3efinition of Phase modulation (PM) is a method of impressing data onto an alternating-current (AC) waveform by varying the instantaneous phase of the wave. This scheme can be used with analog or digital data.

Also we define that, the term PM or phase modulation definition is a type of modulation intended for transmitting communication signals. It changes message signal in accordance with the carrier signal due to differences in the immediate phase. This modulation is the combination of two principal forms such as frequency modulation and angle modulation.

For a baseband signal, x(t):

$xPM(t) = Ac \cos[2\pi fct + kp\, x(t)]$

kp is the frequency deviation constant in rad/volt

A constant envelope signal with varying frequency/phase

The instantaneous phase is:

$F_i(t) = 2\pi fct + kp\, x(t)$

The instantaneous frequency is:

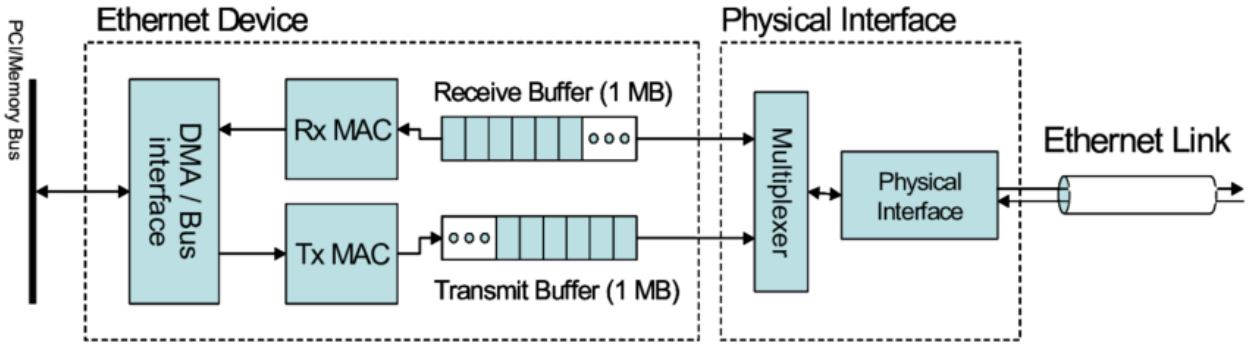
$fi(t) = fc\, K_p/2\pi * Dx(t)/dt$

……..

**Q4: Compare Ethernet and Token Ring concept of data networking with diagrams. Which one is better in your opinion and why?**

**Difference between Token ring and Ethernet**

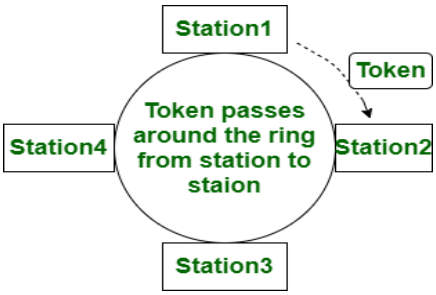
1. **.Ethernet :**
   **IEEE 802.3 defines the Ethernet. It uses CSMA/CD mechanism. It means that if many stations exist at the same time to talk, all stations will be closed. To resume them, wait for a random time. Unlike token ring it doesn't employ any priorities. And it is less costly than token ring network. The system used for connecting various computers to form a local area network and has different protocols to ensure the passage of information takes place smoothly.**




2. **Token Ring**

The local area network which has the properties to transmit the node only when it has certain pieces in succession that come from the other successive nodes turn by turn.

In the token ring a token ring passes over a physical ring. Token ring is defined by IEEE 802.5 standard. In token ring, there is a station and a special frame called token. A station in token ring can transmit data frame if it contains a token. After the successful transmission of data frame token are pointed(issued). Token ring is a Star shaped topology and handles priority in which some nodes may give priority to the token.




Let's see the difference between the token ring and Ethernet:-

| S.NO | TOKEN RING | ETHERNET |
|---|---|---|
| 1. | In the token ring, the token passing mechanism is used. | While Ethernet uses CSMA/CD(Carrier-sense multiple access/collision detection) mechanism. |
| 2. | Token ring is defined by IEEE 802.5 standard. | Whereas Ethernet is defined by IEEE 802.3 standard. |
| 3. | Token ring is deterministic. | While it is non-deterministic. |
| 4. | Token ring is a Star shaped topology. | While Ethernet is a Bus shaped topology. |
| 5. | The token ring handles priority in which some nodes may give priority to the token. | While Ethernet does not employ priority. |
| 6. | Token ring costs more than Ethernet. | While Ethernet cost seventy percent less than token ring. |
| 7. | In the token ring telephone wire is used. | While in Ethernet coaxial cable(wire) is used. |
| 8. | The token ring contains routing information. | While Ethernet does not contain routing information. |

**Which one is better in your opinion and why?**

Ethernet is better because Ethernet is fast then ring token sent message dairectly to any user search every website no data redundancy.

## Q5. Explain the concept and review of Reliable Transmission with diagram (from a research paper of 2019 or 2020) and its functionality. The name and reference of paper should be given.

### Answer: definition of Reliable Transmission

In computer networking, a reliable protocol is a communication protocol that notifies the sender whether or not the delivery of data to intended recipients was successful. ... Transmission Control Protocol (TCP), the main protocol used on the Internet, is a reliable unicast protocol.

**Reserch Paper Name and reference:**

Channel assignment based coding mechanism for reliable transmission for smart cities

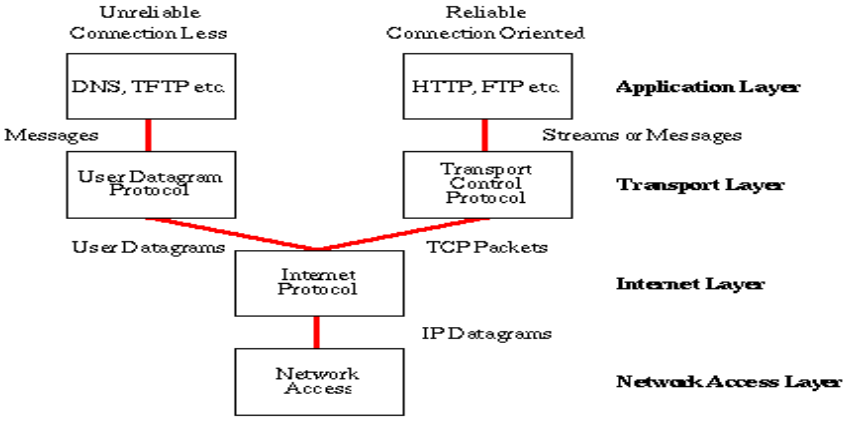
Ram Kumar Jayaraman1·Gunasekaran Raja1

**<u>concept and review of Reliable Transmission</u>:**

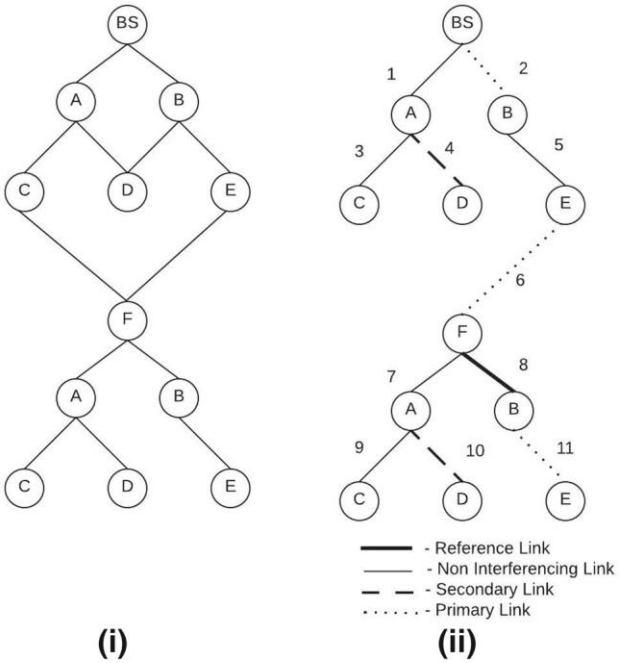
Rapid changes in modern life, especially in population, economy, and technology, have created a high demand for energy. Electricity is intertwined with most aspects of modern life because modern society considers it an indisputable right [1]. Maintaining a continuous power supply is an indicator of prosperity and national development. Therefore, providing customers with secure and reliable power is a priority of decision makers.

The Concept and review of the Reliable transmission, with the increasing demand for wireless services and better user experience in recent days, Broadband Wireless Net- works (BWNs) face a high demand for data reliability and network throughput [1]. The number of mobile users is going to be 9 billion in 2021 as forecasted by Ericsson Mobility report [2]. Primary comparison of Point to Multi-Point (PMP) and mesh topology are discussed in [3]. These discussions prove that the mesh network topology i.e., Wireless interoper- ability for Microwave Access (WiMAX) is more affordable for the deployment of the proposed Code-Encoding and Decoding (C-ED) algorithm. When the number of nodes increases in the limited area, the interference and Data Dis- semination (DD) problem occur among the user devices. WiMAX is widely used to provide high data rate over the longer distance (i.e., last mile connectivity) to reduce the interference and DD problem. However, both the interference and DD are open issues to be sorted out for the improvement of channel assignment and routing [4–6].

Integration of channel assignment, scheduling and routing are mutually dependent and considered as an NP-complete problem in Orthogonal Frequency Division Multiplexing (OFDM) based on BWN [3]. In this paper, we propose a novel C-ED mechanism which helps to minimize the DD prob- lem. The channel assignment helps in assigning the number of channels in the network. In channel assignment strategy, we schedule a link by allocating a minimal number of time slots for data transmission to avoid primary



interference [7].




The related study is discussed in Sect. 2, and the system model is elaborated in Sect. 3. In Sect. 4 the performance of E-CD mechanism with CP-CA and Random-CA is analyzed. Conclusion and scope for future study are given in Sect. 5**.**

**……...…**