53 (IT 302) DTCM

2018

DATA COMMUNICATION

Paper : IT 302

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer question no. ***1*** *and* ***any four*** *from the rest.*

1. *(a)* Choose the correct option : 1×10=10

   (i) Which topology requires a central controller or hub ?

   A. Mesh

   B. Star

   C. Bus

   D. Ring

(ii) A television broadcast is an example of _____ transmission.

A. simplex

B. half duplex

C. full duplex

D. automatic

(iii) The _____ layer is responsible for the delivery of a message from one process to another.

A. Physical

B. Transport

C. Network

D. None of the above

(iv) A periodic signal completes one cycle in 0·001*s*. What is the frequency?

A. 1 *Hz*

B. 100 *Hz*

C. 1 *kHz*

D. 1 *MHz*

(v) A signal is measured at two different points. The power is P1 at the first point and P2 at the second point. The *dB* is 0. This means _____.

A. P2 is zero

B. P2 equals P1

C. P2 is much larger than P1

D. P2 is much smaller than P1

(vi) The Nyquist theorem specifies the minimum sampling rate to be _____.

A. equal to the lowest frequency of a signal

B. equal to highest frequency of a signal

C. twice the bandwidth of a signal

D. twice the highest frequency of a signal

(vii) AM and FM are examples of _____ conversion.

A. digital to digital

B. digital to analog

C. analog to analog

D. analog to digital

(viii) Which multiplexing technique involves signals composed of light beams?

A. FDM
B. TDM
C. WDM
D. None of the above

(ix) Which of the following primarily uses guided media?

A. Cellular telephone system
B. Local telephone system
C. Satellite communications
D. Radio broadcasting

(x) In _____, each station sends a frame whenever it has a frame to send.

A. pure ALOHA
B. slotted ALOHA
C. both A and B
D. neither A nor B

(b) Answer the following questions: 2×5=10

(i) Differentiate between error detection and error correction.

(ii) Differentiate between node to node and host to host communication.

(iii) What are various network topologies?

(iv) What is bit rate and baud rate?

(v) What are networking devices?

2. (a) In a CRC error detecting scheme, choose $P(x)=x^4+x+1$. Encode the bits 10D10011011. Suppose the channel introduces an error pattern 10001000000 (i.e a flip from 1 to 0 or from 0 to 1 in position 1 and 5). What is received? Can the error be detected? 5+5=10

(b) Consider building a CGMA/CB network running at 10 *Mbps* with a network cable of 2500 meter (consisting of five network segments each having a length of 500 meter and connected by using four repeaters). Considering the delays in the repeaters, the average signal speed in the network cable is 100 *m/μsec*. Calculate the minimum frame length in bytes, so that when a collision occurs, computers can determine that the collision is related to the frame being sent. 5

(c) Briefly explain any digital data to analog signal conversion technique. 5

3. *(a)* List *three* benefits of spread spectrum. What is direct sequence spread spectrum? 3+2=5

(b) Assume that a voice channel occupies a bandwidth of 4*kHz*. We need to multiplex 12 voice channels with guard bands of 500*Hz* using FDM. Calculate the required bandwidth. 5

(c) What is the significance of twisting in twisted pair cable? How do guided media differ from unguided media? Explain in brief about Optical Fibre cable with a diagram. 3+2+5=10

4. What are the advantages of packet switching compared to circuit switching? What are the phases in Virtual Circuit Network? Explain the working of virtual circuit network with a diagram. 5+3+12=20

5. *(a)* In the data link layer of a computer network, bit oriented framing and bit stuffing method is applied. Assuming that 01110 bit string is used as the starting and ending delimiter, 5+5=10

(i) At the sender, if the bit string delivered by the network layer to the data link layer is given as

follows, obtain the bit string at the data field of the sender's data link layer frame.

10111111001110001111

(ii) At the receiver, if the bit string delivered by layer 1 to layer 2 is as follows, obtain the bit string before bit stuffing.

011100010100110011011000110011010001110

(b) Compare and contrast Manchester and Differential Manchester Encoding. Given this bit pattern 011001001, encode this data using Manchester and differential Manchester encoding. 5+5=10

6. Explain in details about functions of various layers of OSI model. What is the significance of layering? What are the addresses used in various layers? Give examples of two Application layer protocols. 10+5+4+1=20

7. Write short notes on : ***(any two)*** 10×2=20

(a) ATM

(b) Bluetooth

(c) Transmission Impairments.
