Name of Subject	Data Communication and Computer Networks	**Subject Code**	PCIT-103
Batch	2018 and onwards	**Class**	D2IT A and B

Each following question carries 02 marks.

1. What are the features of TCP?
2. Explain about UDP.
3. Explain about Process-to-Process Delivery.
4. Write about CSMA/CD protocol.
5. Explain about Control Fields of HDLC frames.
6. Explain about HDLC Configurations, Transfer Modes and different types of frames.
7. Write about Selective Repeat ARQ protocol.
8. Write about Go-Back-N ARQ protocol.
9. Write about Stop and wait with ARQ protocol.
10. Write about Stop and wait protocol.
11. A sine wave is offset 1/6 cycle with respect to time 0. What is its phase in degrees and radians?

    Ans: We know that 1 complete cycle is 360°. Therefore, 1/6 cycle is

$$\frac{1}{6} \times 360 = 60^{\circ} = 60 \times \frac{2\prod}{360} rad = \frac{\prod}{3} rad = 1.046 rad$$

12. The period of a signal is 100 ms. What is its frequency in kilohertz?

Ans: First we change 100 ms to seconds, and then we calculate the frequency from the period (1 Hz = 10^{-3} kHz).

100 ms = $100X10^{-3}s = 10^{-1}$ s

$F=1/T = 1/10^{-1} = 10Hz = 10X10^{-3}kHz = 10^{-2}$ kHz

13. Calculate the checksum for the following packets:

    10110 11010 10001

Ans: Add the packets using 1's complement.

We get: 00011

Take complement: 11100

Thus checksum is 11100

14. Write about TCP segment?
15. What is Attenuation?

16. Write about different steps to create a TCP Connection.
17. Explain AM, FM and PM.
18. Write about Flow Control in TCP.
19. Explain the concept of MODEM.
20. Write about Error Control in TCP.
21. Explain ASK,FSK , and PSK with neat diagram.
22. Write short notes on (1) Hierarchical routing (2) Broadcast routing.
23. What is the necessary for framing?
24. Write short notes on (1) Distance vector routing (2) Link state routing.
25. What is Piggybacking?
26. Write a short note on (1) Voice over IP (2) JPEG.
27. What do you mean by Wireless LANs?
28. Write a short note on e-mail.
29. What do you mean by ATM?
30. Write short notes on (1) shortest path routing algorithm (2) Flooding.
31. Explain the concept of WWW.
32. What are the key assumptions in dynamic channel allocations in LAN?
33. Explain (1) Repeater (2) Bridge (3) Router (4) Gateway.
34. What are the classes of transmission media?
35. What are the Optical Properties of Radio Waves?
36. What are the Modes of Optical Fiber?
37. How we can check the effectiveness of data communication?
38. Explain about Satellite Communications Systems With neat sketch.
39. Define PAM. Explain its limitation.
40. Compare Virtual circuit subnet and datagram subnet.
41. Write about Circuit Switched Network.
42. Briefly explain the losses that occur in optical fiber cable.
43. Define Electrical Noise? Explain various types of Noise in detail.
44. Write about Unguided medium?
45. Distinguish between data rate and signal rate. Write about Guided medium?

Each following question carries 05 marks.

1. Explain the concept of Simple Mail Transfer Protocol (SMTP).
2. What is meant by linear Block Code and explain Simple Parity-Check Code?

3. What are the different spread spectrum techniques?
4. What is transmission medium? What are the different types of transmission medium?
5. What are the congestion control policies in (1) Data link (2) Network (3) Transport Layer?
6. What is switching and what are the different types of Switching Techniques?
7. Write about Block Coding and explain how the errors are detected and corrected using Block coding?
8. Write about Virtual Circuit Network.
9. What is cyclic code and explain Cyclic Redundancy Check (CRC) code?
10. Write short notes on (1) flow control in data link layer (2) Error detection and Correction in data link layer.
11. Explain the concept of HTTP.
12. Explain different types of errors in data transmission.
13. How is the congestion control done in datagram subnets?
14. Write short notes on Pure and slotted ALOHA.
15. What is framing and explain different framing algorithms?
16. Explain the concept of FTP.
17. Write short notes on : (1) 1-bit sliding window protocol (2) Go-back N protocol.
18. Explain the protocols in Data link layer.
19. Write short notes on (1) Wireless in local loop (2) SONET/SDH.
20. Explain the Point to Point Protocol in detail.
21. Write a short note on leaky bucket algorithm.
22. Explain connection establishment and connection release in transport layer.
23. Write short notes on : (1) Protocol using selective repeat (2) Stop and Wait protocol.
24. Explain the MULTIPLE ACCESS PROTOCOLS in detail.
25. Write short notes on IPv4 and IPv6.
26. Compare circuit switching with packet switching.
27. Write short notes on persistent and non persistent CSMA protocols.
28. Explain the concept of ALOHA
29. Write short notes on (1) A bit map protocol (2) Binary countdown
30. Explain the functions of modem in brief.
31. Write short notes on: (1) HDLC (2) PPP.
32. Write short notes on : (1) Adaptive tree walk protocol (2) Wavelength Division Multiple Access Protocol

33. Explain the concept of CDMA.
34. Explain the functioning of Digital Subscriber Line.
35. Write a short note on fragmentation in network layer.
36. Explain the concept of Slotted Aloha
37. Explain the concept CONGESTION CONTROL ALGORTIHM
38. Explain CSMA with collision detection protocol.
39. Explain the Wireless LAN protocols in Medium Access Sublayer.
40. If a periodic signal is decomposed into five sine waves with frequencies of 200,400, 600, 800, and 1000 Hz, what is its bandwidth? Draw the spectrum, assuming all components have a maximum amplitude of 10 V.

Ans: Let f_h be the highest frequency, f_l the lowest frequency, and B the bandwidth. Then

$$B = f_h - f_l = 1000 - 200 = 800 \text{ Hz}$$

The spectrum has only five spikes, at 200, 400, 600, 800, and 100 Hz (see Figure 1).

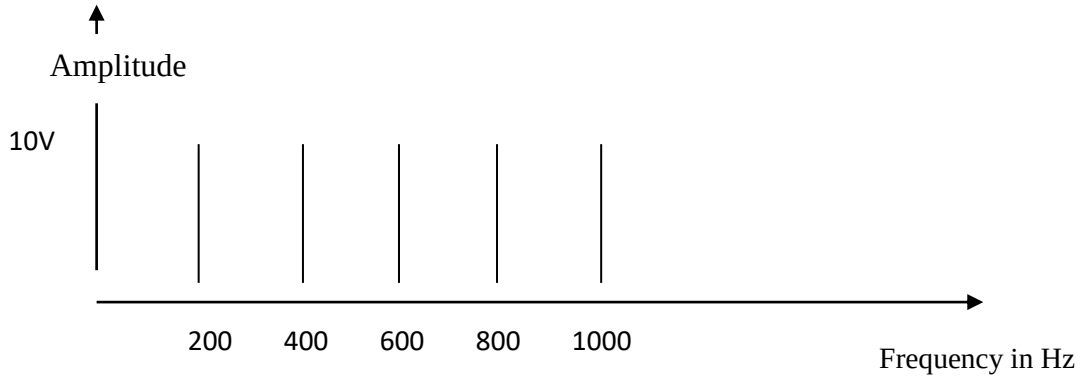


Figure 1

41. Obtain the 4-bit CRC code word for the data bit sequence 10011011100 (leftmost bit is the least significant) using the generator polynomial given in the previous problem.

Ans: Divide (Mod-2) 001110110010000 by 10101 to get 4-bit code word: 1101. Details of the steps is given below

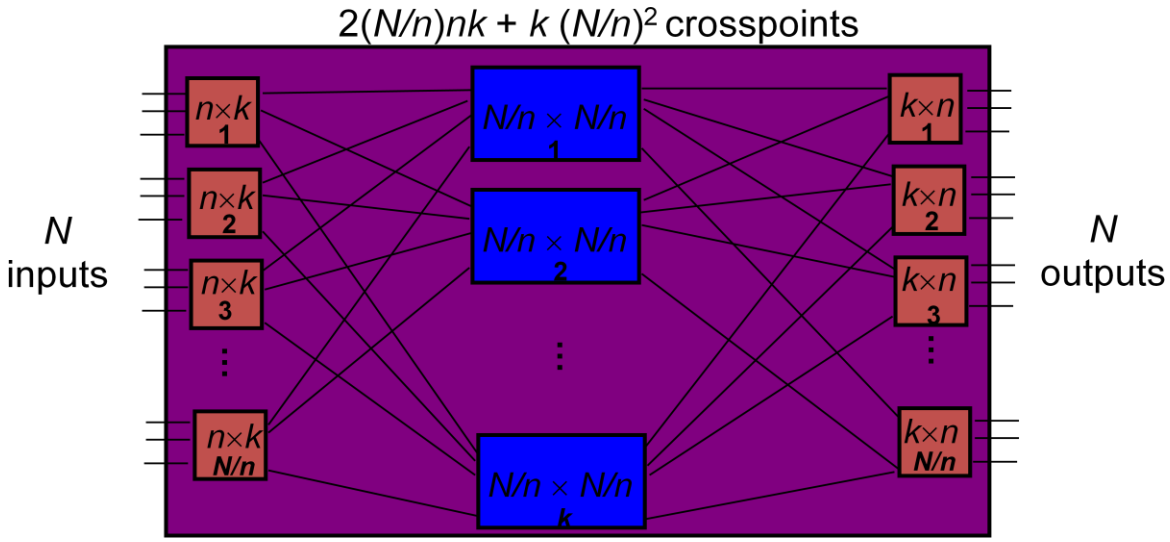
```
10101 ⌊ 001110110010000
        10101
      ----------
        10001
        10101
      ----------
        10000
        10101
      ----------
        10110
```

10101

11000
10101

1101

42. Consider the multistage switch in Figure 2 with N = 16, n = 4, k = 2. a. What is the maximum number of connections that can be supported at any given time?

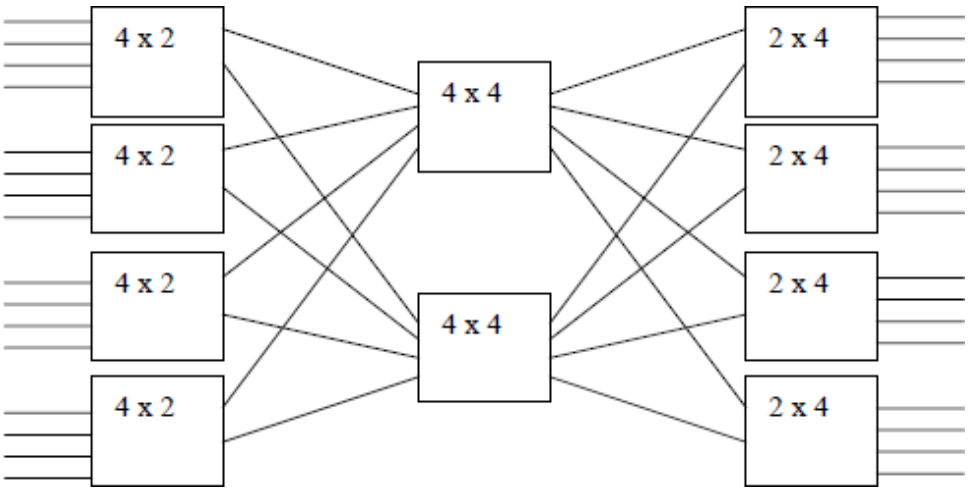


Ans:

For N = 16, n = 4 and k = 2, we have the following switch architecture: The number of switches for the first stage: N/n = 16/4 = 4

The number of switches for the 2nd stage: k = 2.

The number of switches for the 3rd stage: N/n = 16/4 = 4 nxk=4x2 , N/n x N/n = 16/4 x 16/4 = 4x4 , kxn = 2x4



43. Four channels , two with a bit rate of 200kbps and two with a bit rate 150 kbps are to be multiplexed using multiple slots TDM with no synchronization bits. Answer the following questions: assume 4 bits from the first 2 sources and 3 bits from the second 2 sources.
    a. What is the size of a frame in bits?
    b. What is the frame rate?
    c. What is the duration of a frame?
    d. What is the date rate?

Ans: . The frame carries 4 bits from each of the first two sources and 3 bits from each of the second two sources.

a. Frame size = 4 × 2 + 3 × 2 = 14 bits.
b. Each frame carries 4 bit from each 200-kbps source or 3 bits from each 150kbps. Frame rate = 200,000 / 4 = 150,000 /3 = 50,000 frames/s.
c. Frame duration = 1 /(frame rate) = 1 /50,000 = 20 μs.
d. Output data rate = (50,000 frames/s) × (14 bits/frame) = 700 kbps. We can also calculate the output data rate as the sum of input data rates because there are no synchronization bits. Output data rate = 2 × 200 + 2 × 150 = 700 kbps.

44. What is the maximum capacity of a medium with a bandwidth of 750KHz and a signal-to-noise ratio of 30dB?

Answer: This is a straight-forward application of the Shannon Theorem, except that we must first convert the SNR from decibels to its "unitless" form:

$$SNR_{dB} = 10 \log_{10} SNR$$

$$SNR = 10^{SNR_{dB}/10} = 10^{30/10}$$

$$= 1000$$

So, applying the Shannon Theorem:

$$C = B \log_2(1 + SNR) = 750KHz \log_2(1 + 1000) * (1Kbps / KHz)$$
$$= 750Kbps * 9.967$$
$$\approx 7475.25Kbps$$

$$\approx 7.475Mbps$$

45. Which two address spaces are valid Class B IPv4 ranges that are non-routable to the internet? (Choose two)

A. 10.0.0.0 through 10.0.255.255

B. 169.254.0.0 through 169.254.255.255

C. 172.16.0.0 through 172.31.255.255

D. 172.16.0.0 through 172.32.255.255

E. 192.168.0.0 through 192.168.255.255

Answer: B C

Explanation

When a host fails to dynamically acquire an address, it can optionally assign itself a link-local IPv4 address in accordance with RFC 3927. Microsoft‟s term for this is Automatic Private Internet Protocol Addressing (APIPA), which ranges from 169.254.0.0 to 169.254.255.255 (169.254.0.0/16).

Addresses from 172.16.0.0 to 172.31.255.255 belong to the private IPv4 address range of class B.

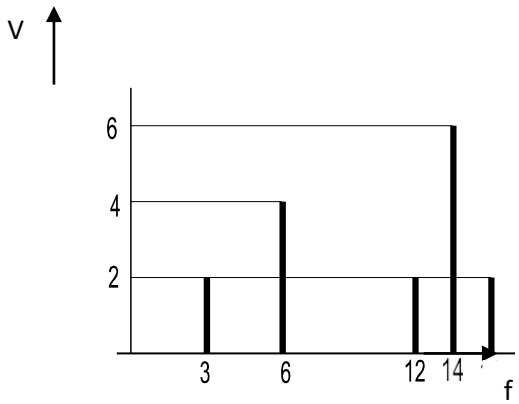
Note: class B range: 128.0.0.0 – 191.255.255.255 (with default subnet mask of /16)

46. Explain the types of transmission modes.
47. What is Shannon capacity for Noisy Channel?
48. Explain the Shielded twisted pair (STP) and Unshielded twisted pair(UTP)
49. Explain the coaxial cable in detail.
50. Explain fiber optic in detail.
51. Write short notes on unguided media
52. Write short notes on circuit switching, packet switching and message switching.
53. What is an error? Explain the types of errors?
54. Explain functioning of connection oriented networks X.25 and frame relay in brief.
55. Explain the ATM reference model along with functions of ATM layers.
56. List several transmission media for networking.Explain any two media in brief.

Each following question carries 10 marks.

1. Explain the OSI model for networking in brief. How does it differ from TCP/IP Model?
2. Explain the functions of physical layer and Data link layer in brief.
3. Explain the functions of network layer and transport layer in brief.
4. Explain the functions of session layer and application layer in brief.
5. Explain Persistence Methods – 1-persistant ,Non-persistant , p-persistant.
6. Explain the CSMA in detail.
7. Explain the CHANNELIZATION – FDMA , TDMA, CDMA.

8. Explain the concept of Token Bus (IEEE 802.4).
9. Explain the concept of Token ring (IEEE 802.5).
10. Given the frequency-domain graph above, answer the following:
    a. What is the frequency spectrum?
    b. What is the bandwidth?
    c. Is this an analog or digital signal? Why?



Answer:

a. The frequency spectrum is the set of frequencies that comprises the signal. In this case: [3, 6, 12, 14, 16].
b. The bandwidth of the signal is the range of frequencies, that is, the difference between the highest and lowest frequency. The highest frequency is 16, the lowest is 3, so the answer is: 16 – 3 = 13 Hz.
c. As discussed in class, a digital signal is represented as a square wave which requires an infinite number of frequencies to represent. Since there are a finite number of frequencies in this signal, is must be analog.

11. Generate the hamming code for the following data:
    100101

Ans: Number of message bits = m = 6

Number of redundant bits = r = ?

$2^r \geq m + r + 1$

r = 4

Thus we have four redundant bits. Thus the code with redundant bits will be as follows:

1	0	r_3	0	1	0	r_2	1	r_1	r_0

We have to make parity even at the following bit positions

1. 1,3,5,7,9 (values: r_0,1, 0, 0,0)

2. 2,3,6,7,10 (values: r_1,1,1,0,1)
3. 4,5,6,7 (values: r_2,0,1,0)
4. 8,9, 10 (values: r_3,0,1)

$r_0 = 1$

$r_1 = 1$

$r_2 = 1$

$r_3 = 1$

Thus, the hamming code is: 1010101111

12. What is network topology? Explain the different network topologies.
13. What are the different types of networks? Explain in detail.
14. Explain the OSI reference model with neat diagram.
15. Explain the tcp/ip reference model with neat diagram.
16. Explain the various types of multiplexing
17. What is the significance of layered architecture in Computer networks?
18. What are the different methods of error detection and explain any two methods.