KATHMANDU UNIVERSITY
End Semester Examination
June/July, 2023

Marks Scored:

Level : B.E.
Year : III
Course : ETEG 303
Semester : II
Exam Roll No. :
Time: 30 mins.
F. M. : 10
Registration No.:
Date 03 JUL 2023

SECTION "A"
[20 Q. × 0.5 = 10 marks]

Encircle the most appropriate answer. Symbols have their usual meanings.

1. The information to be communicated in a data communications system is the _____.
   a. Medium b. Protocol c. Message d. Transmission

2. Frequency of failure and network recovery time after a failure are measure of the ____ of a network.
   a. Performance b. Security c. Reliability d. Feasibility

3. Which agency developed standards for physical connection interfaces and electronic signaling specifications?
   a. EIA b. ITU-T c. ISO d. ANSI

4. In a _____ connection, three or more devices share a link.
   a. point-to-point b. multipoint c. both a and b d. none of them

5. The loss of power a signal suffers as it travels from a transmitting computer to a receiving computer is called_____.
   a. Echo b. Jitter c. Spiking d. Attenuation

6. In _____ transmission, the channel capacity is shared by both communicating devices at all times.
   a. simplex b. half-duplex c. full-duplex d. half-simplex

7. The _____ layer adds a header to the packet coming from the upper layer that includes the logical addresses of the sender and receiver.
   a. data link b. network c. physical d. none of these

8. _____ is a protocol suite for internet.
   a. Unix b. TCP/IP c. NCP d. ACM

9. Mail services are available to network users through the _____ layer.
   a. Transport b. Physical c. Data link d. Application

10. Ethernet uses a _____ physical address that is imprinted on the network interface card (NIC).
    a. 32-bit b. 6-byte c. 64-bit d. 8-bit

11. The number of addresses in a class C block is_____.
a. 65534 b. 16777216 c. 256 d. 1024

12. _____ is a process-to-process protocol that adds only port addresses, checksum error control, and length information to the data from the upper layer.
a. IP b. TCP c. UDP d. None of these

13. When propagation speed is multiplied by propagation time, we get the _____.
a. wavelength of the signal b. throughput
c. distance a signal or bit has traveled d. distortion factor

14. If the available channel is a _____ channel, we cannot send a digital signal directly to the channel.
a. low-pass b. low rate c. bandpass d. high rate

15. To guarantee correction of up to 5 errors in all cases, the minimum Hamming distance in a block code must be _____.
a. 11 b. 6 c. 5 d. 16

16. What is the first address of a block of classless addresses if one of the addresses is 12.2.2.127/28?
a. 12.2.2.0 b. 12.2.2.96 c. 12.2.2.112 d. None of these

17. An organization is granted a block; one address is 2.2.2.64/20. The organization needs 10 subnets. What is the subnet prefix length?
a. /20 b. /24 c. /25 d. /15

18. UDP needs the _____ address to deliver the user datagram to the correct application process.
a. Port b. Application c. internet d. Mac

19. _____ means that a sender must not be able to deny sending a message that he sent.
a. Confidentiality b. Integrity
c. Authentication d. Non repudiation

20. A ____network is a cross between a circuit-switched network and a datagram network. It has some characteristics of both.
a. packet-switch b. frame-switched
c. virtual-switched d. Datagram

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SECTION "B"
[4Q × 10 = 40 marks]

Attempt *ANY FOUR* questions.

1.

a. Show the layers of TCP/IP protocol suite and the flow of data when two hosts, one in Kathmandu University and other in Pokhara exchange messages. [4]

b. We need to use synchronous TDM and combine 20 digital sources, each of 100 Kbps. Each output slot carries 1 bit from each digital source, but one extra bit is added to each frame for synchronization. Answer the following questions: [4]
   i. What is the size of an output frame in bits?
   ii. What is the output frame rate?
   iii. What is the duration of an output frame?
   iv. What is the output data rate?

c. What is the role of the address field in a packet traveling through a datagram network? [2]

2.

a. Distinguish between a point-to-point link and a broadcast link. [2]

b. Draw the flow diagram using the following scenario. [2]
   i. The first frame is sent and acknowledged.
   ii. The second frame is sent and acknowledged, but the acknowledgment is lost.
   iii. The second frame is resent, but it is timed-out.
   iv. The second frame is resent and acknowledged.

c. Explain why we need a timer at the sending site, but none at the receiving site. [2]

d. Explain encoding and decoding process of a (7, 4) CRC code with an example for divisor 1011. [4]

3.

a. Throughput for slotted Aloha is given by $S = Ge^{-G}$ where, G is the average number of frames generated by the system. Find the value of G that makes the throughput of the system maximum and find the value of maximum throughput. [2]

b. A slotted ALOHA network transmits 200-bit frames using a shared channel with a 200 kbps bandwidth. Find the throughput if the system (all stations together) produces. [3]
   i. 1000 frames per second
   ii. 500 frames per second
   iii. 250 frames per second

c. Explain CSMA/CA and list some of the strategies that are used to avoid collision. [5]

4.

a. The size of a block assigned to an organization is less than the number of hosts in the organization. Assume you are system administrator; how will you solve this problem so that all the hosts in the organization get access to the internet. [4]

b. An organization is granted a block of addresses with the beginning address 14.24.74.0/24. The organization needs to have 3 subblocks of addresses to use in its three subnets: one subblock of 10 addresses, one subblock of 60 addresses, and one subblock of 120 addresses. Design the subblocks. [4]

c. Why is UDP unreliable? Explain with reasons. [2]

5.

a. How does congestion in network layer effect throughput and delay performance? Explain with suitable reasons. [4]

b. Find the shortest path for given network below using Bell man Fords Algorithm. [6]