**Ahsanullah University of Science& Technology**
Department of Computer Science and Engineering
Year: 4th, Semester: 1st, Final Examination (Fall 2016)
Course No: CSE 4101, Course Title: Computer Networks

Time: 3 Hours

Full Marks: 70

[There are <u>Seven (7)</u> Questions. Answer any <u>Five (5)</u> Questions.]
[Marks allotted are indicated in the margin.]

Q1. a) Define computer network. Discuss the three criteria necessary for an effective and [4] efficient network.

b) Draw the relationship between the adjacent layers and interfaces through the SAPs. [2]

c) What is a service primitive? Describe the main six types of primitives used for [5] implementing a simple connection-oriented service.

d) State the dissimilarities between the OSI model and TCP/IP model. [3]

Q2. a) A time domain periodic signal s(t) is defined by following function: [5]

$$s(t) = \begin{cases} 1 & -T/4 < t < T/4 \\ -1 & -T/2 < t < -T/4 \\ -1 & T/4 < t < T/2 \end{cases}$$

Draw the signal in time domain, find the Fourier coefficients and signal in frequency domain.

b) Describe the Store-and-Forward transmission technique used in packet switched [2] network.

c) Discuss the total internal reflection and the structure of fiber optic cable. [3]

d) Suppose the packet is 1,500 bytes, the propagation speed on all three links is $2.5 \times 10^8$ [4] m/s, the transmission rates of all three links are 2 Mbps, the packet switch processing delay is 3 msec, the length of the first link is 5,000 km, the length of the second link is 4,000 km, and the length of the last link is 1,000 km. For these values, what is the end-to-end delay?

Q3. a) What is framing? State any two techniques of framing with example. [5]

b) Compare between unacknowledged connectionless service and acknowledged [2] connectionless service.

c) Describe different types of frame used in HDLC. [3]

d) Consider the Hamming code C(7,4), where k=4 and n=7. Now answer the following [4] questions:

i. Find out the codeword to transmit the dataword: 1011

ii. The codeword 1110010 was received. Find out the dataword sent to the NL by DLL. [Consider *error correction process*]

Q4. a) Show that the window size of Go-back-N ARQ protocol will be $2^n-1$, where n is the [4] number of bits used for sequence number. Explain with examples.

b) Describe the three types of persistent CSMA protocol. [3]

c) Define piggybacking with example. [2]

d) Draw the sender and receiver windows for a system using Selective Repeat ARQ, [5] where a 3 bit field is used and given the following:

    i. Frame 0 is sent; Frame 0 is received.

    ii. Frames 1 and 2 are sent; Frames 1 and 2 are received.

    iii. Frames 3, 4, and 5 are sent; Frames 4 and 5 is received; Timer for Frame 3 expires.

Q5. a) Compare virtual circuit network with datagram network. [2]

b) Find the shortest path from router B to H for the following subnet using Dijkstra's [4] algorithm.
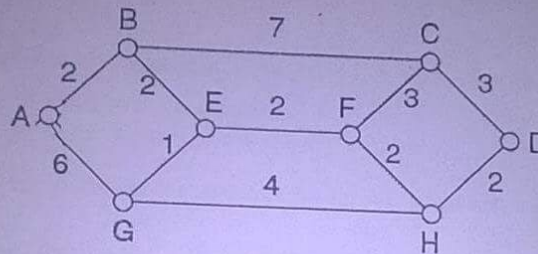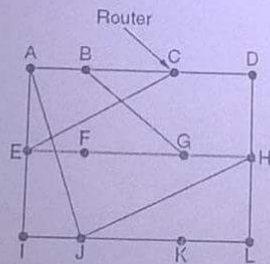


Fig: Subnet of 5(b)

c) Calculate the new routing table for router J in the following subnet using distance [4] vector routing algorithm.



| To | A | I | H | K |
|----|----|----|----|----|
| A | 0 | 24 | 20 | 21 |
| B | 12 | 36 | 31 | 28 |
| C | 25 | 18 | 19 | 36 |
| D | 40 | 27 | 8 | 24 |
| E | 14 | 7 | 30 | 22 |
| F | 23 | 20 | 19 | 40 |
| G | 18 | 31 | 6 | 31 |
| H | 17 | 20 | 0 | 19 |
| I | 21 | 0 | 14 | 22 |
| J | 9 | 11 | 7 | 10 |
| K | 24 | 22 | 22 | 0 |
| L | 29 | 33 | 9 | 9 |
| | JA delay is 8 | JI delay is 10 | JH delay is 12 | JK delay is 6 |

Fig: Subnet of 5(c)

d) How does hierarchical routing protocol help in large networks? Explain with [4] example.

Q6. a) How does leaky bucket and load shedding help in congestion control? [4]

b) A computer on a 10-Mbps network is regulated by a token bucket. The token bucket [3] is filled at a rate of 2 Mbps. It is initially filled to capacity with 16 megabits. How long can the computer transmit at the full 10 Mbps?

c) An ISP is granted a block of addresses starting with 190.100.0.0/16. The ISP needs to [7] distribute these addresses to three groups of customers as follows:

    1. The first group has 64 customers; each needs 256 addresses.
    2. The second group has 128 customers; each needs 128 addresses.
    3. The third group has 128 customers; each needs 64 addresses.

Design the subblocks and give the slash notation for each subblock. Find out how many addresses are still available after these allocations.

Q7. a) Using the RSA public key cryptosystem, with $a = 1$, $b = 2$ ... $y = 25$, $z = 26$.

    i. Using $p = 3$ and $q = 11$, find d and e.
    ii. Encrypt the word "hello".

b) Break the following columnar transposition cipher into plain text using MEGABUCK as the key:

    AFLLSKSOSELAWAIATOOSSCTCLNMOMANT
    ESILYNTWRNNTSOWDPAEDOBUOERIRICXB

c) Describe the basic encryption model.

d) Describe different DNS resolution technique used in the internet with examples.