BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
DUBAI CAMPUS, U.A.E.

SECOND SEMESTER, ACADEMIC YEAR 2013-14

ECE C394/ ECE F343 COMMUNICATION NETWORKS

Evaluation Component: Comprehensive Examination (Closed Book)

Date: 27.05.2014 (Tuesday) Max. Marks: 35
Duration: 3 Hrs. (AN-12:30PM-3:30PM) Weightage: 70%

Note: - Answer ALL Questions.

1.
   A. Depict the typical OSI model and State the functions of each of the layers. [4 M]
   B. A broadcast network is one in which a transmission from any one attached station is received by all other attached stations over a shared medium such as a bus-topology LAN (Ethernet) and a wireless radio network.
      Discuss
      i. the need [3 M]
      ii. lack of need [3 M]
      for a network layer in a broadcast network.

2. Suppose that an FDDI LAN is used to meet the packet voice requirements of a set of users. Assume voice information uses 64 kbps coding and that each voice packet contains 20ms worth of speech.
   A. How many stations can the FDDI accommodate while meeting the transfer requirement? such that: each station handles a single voice call and that stations are 100 meters apart employing FDDI ring transferring each voice packet within 10 ms.[4 M]
   B. How many simultaneous calls can be handled if each station is allowed to handle up to 8 calls? [4 M]

3. Compare FDMA, TDMA and CDMA in terms of their ability to handle groups of stations that produce information flows that are produced at constant but different bit rates. [6 M]

4. Identify the address class of the following IP addresses [6 M]
   A. 200.58.20.165
   B. 128.167.23.20
   C. 16.196.128.50
   D. 250.10.24.96

5. Rank the LANs: Switched LAN, Wireless LAN and Shared LAN, from most secure to least secure and Explain with reasoning as why so? [6 M]

6. Three possible strategies for sending ACK frames in a Go-Back-N settings are as follows: (i)Send and ACK frame immediately after each frame is received; (ii)Send an ACK frame after every other frame is received; (iii) send an ACK frame when the next piggyback opportunity arises. In the situations given below, which of the above three strategies are "most appropriate" and why?

[P.T.O]

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
DUBAI CAMPUS, U.A.E.

SECOND SEMESTER, ACADEMIC YEAR 2013-14

A. An interactive application produces a packet to send each keystroke from the client; server echoes each keystroke that it receives from the client. [3 M]

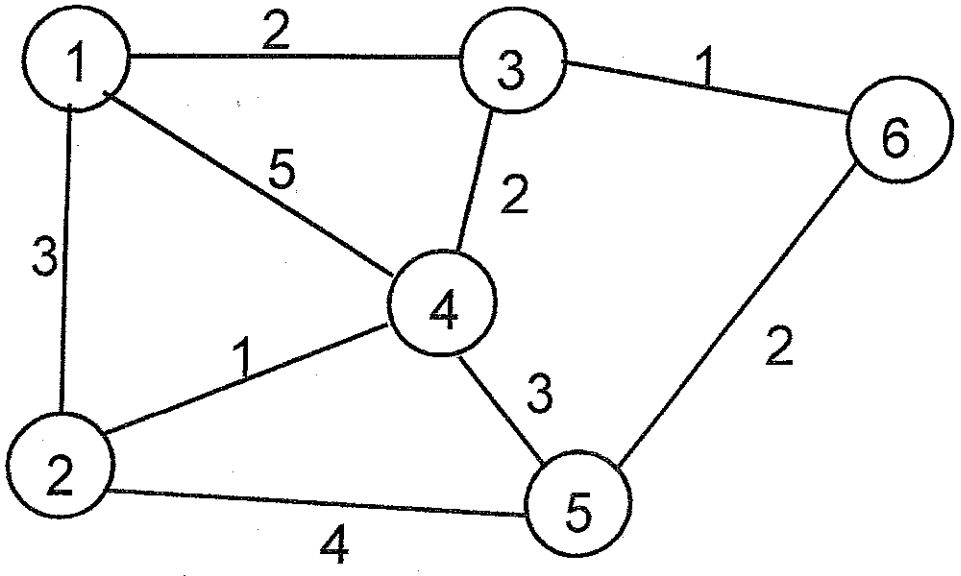
B. A bulk data transfer application where a server sends a large file that is segmented in a number of full-size packets that are to be transferred to the client. [2 M]

7. A telephone modem is used to connect a personal computer to a host computer. The speed of the modem is 56 kbps and the one-way propagation delay is 100ms. Assuming, a bit error rate of 10^{-4} Find the efficiency for

   A. The Stop-and-Wait ARQ if the frame size is 256 bytes [3 M]

   B. The Go-Back-N ARQ strategy if 3-bit sequence numbering is used with frame sizes 512 bytes. [3 M]

8. Consider the network shown in Fig. below.



   A. Use Bellman-Ford algorithm to find the set of shortest paths from all nodes to destination node 2. [4 M]

   B. Continue the algorithm after the link between node 2 and node 4 goes down. [4 M]

9. Consider the three-stage crossbar N x N switch with 3 stages: N x k concentration stage; a k x k crossbar stage; and a k x N expansion stage.

   A. Explain Under what traffic load conditions this configuration may save on hardware costs? [2 M]

   B. When does this 3-stage switch fail to provide a connection between an idle input and an idle output line? [2 M]

   C. Explain why a space-time-space implementation of this N x N switch makes sense by identifying the factors that limit the size of the switches that can be built using this approach. [2 M]

10. Write Short-notes on: [9 M]

(A) ATM Network Architecture; (B)ISDN; (C)Limitations of Adhoc Networks

——→ XXX —— ALL THE BEST —— XXX ——→

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
DUBAI CAMPUS, U.A.E.

SECOND SEMESTER, ACADEMIC YEAR 2013-14

EEE C394 & ECE F343 COMMUNICATION NETWORKS

Evaluation Component: TEST-2 (OPEN Book)

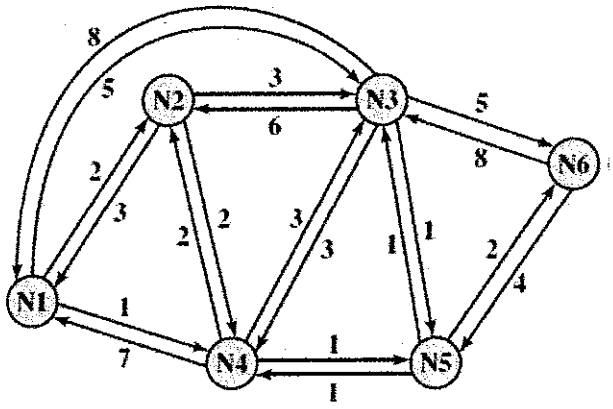
Date: 23.04.2014 Max. Marks: 40

Duration: 50mts. (12:05PM-12:55PM) Weightage: 20%

Note: - 1. Answer ALL Questions with the most appropriate responses.
2. State explicitly assumptions made, if any
3. **Prescribed Text Books(2)**, "**hand-written class-notes** and/or **ClassSlides** permitted.

1.

A. Figure below illustrates a network in which two arrowed lines between a pair of nodes represent a link between these nodes and corresponding numbers represent the current link cost in each direction. Employing **either Dijkstra's Algorithm OR the Bellman-Ford Algorithm**, generate a least-cost route to all other nodes of the network, for nodes 2 through 6. **[6M]**



B. Will both the Dijkstra's algorithm and the Bellman-Ford algorithm yield the same solution? Why or why not? – Justify your answer **[4M]**

2.

A. Ten 9600-bps lines are to be multiplexed using TDM. [1.5+2.5=**4M**]

i. Ignoring overhead bits in the TDM frame, what is the total capacity required for synchronous TDM?

ii. Assuming that, as an design engineer, you wish to limit average TDM link utilization to 0.8, and assuming that each TDM link is busy 50% of the time, What is the capacity required for statistical TDM?

B. Twenty-four voice signals (in a telephone network using PCM) are to be multiplexed and transmitted over twisted pair [1.5+2.5=**4M**]

i. What is the bandwidth required for FDM?

ii. Assuming bandwidth efficiency (ratio of data rate to transmission bandwidth) of 1 bps/Hz, what is the bandwidth required for TDM using PCM.

3. A Synchronous TDM is to be used to combine four 4.8-kbps and one 9.6-kbps signals for transmission over a single leased line. For framing, a block of 7 bits (pattern 1011101) is inserted for each 48 data bits. If the reframing algorithm (at the receiving demultiplex) is:

I. Arbitrarily select a bit position

II. Consider the block of 7 contiguous bits starting with that position

III. Observe that block of 7 bits each frame for consecutive frames. **[Please Turn Over]**

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
DUBAI CAMPUS, U.A.E.

SECOND SEMESTER, ACADEMIC YEAR 2013-14

IV. If 10 of the 12 blocks match the framing pattern the system is "in-frame". If not, advance one bit position and return to step-II.

A. Treating 9.6kbps input as two 4.8-kbps inputs, draw the multiplexed bit stream. **[3M]**

B. What is the % overhead in the multiplexed bit stream? **[2M]**

C. What is the multiplexed output bit rate? **[2M]**

4. A Channel has a data rate of 4 kbps and a propagation delay of 20ms. **For what range of frame size** (expressed in no. of bits) does the Stop-and-Wait ARQ give a link efficiency of at least 50%? **[5M]**

5. In a small convenience store there's room for only 4 customers. The owner himself deals with all the customers - he likes chatting a bit. On average it takes a customer 4 minutes to pay for his/her purchase. Customers arrive at an average of 1 per 5 minutes. If a customer finds the shop full, he/she will go away immediately. If the arrival-departure be treated as a "birth-death" process of a typical and most realistic queue such as M/M/1/K model, stating explicitly the assumptions made, if any, estimate the following:

A. What fraction of time will the owner be in the shop on his own? **[2.5M]**

B. What is the mean number of customers in the store? **[2.5M]**

C. What fraction of customers is turned away per hour? **[2.5M]**

D. What is the average time a customer has to spend for check-out? **[2.5M]**

* * *) ==(* * *

ALL THE BEST

* * *) ==(* * *

ID No. _____ Name: _____ **A**

BITS Pilani, Dubai Campus, Dubai International Academic City, Dubai

III Yr. B.E. (Hons.) Second Semester Academic Year 2013 – 2014

Communication Networks: QUIZ - 2 (Closed Book)

Course No. : **ECE C394 / ECE F343** Date : 14.05.2014
Duration : 20 min. (12:10PM-12:30PM) Max Marks : 16
Weightage : 8%

Note: 1. Answer all Questions with MOST Appropriate Responses
2. Use reverse side of each sheet for your rough work, if any.

- - -

1) With reference to Communication Networks, Expand the following Acronyms : [1M]

A) TCP / IP: _____ / _____

B) ATM : _____

C) ISDN: _____

D) FDDI: _____

2) ISDN standards define two interfaces as below: [3 M]
A) _____ with ____ kbps bearer channels and ____ kbps data channel.
B) _____ with _____, _____ nos. of bearer & data channels, respectively.

3) Depict the basic structure of TCP/IP protocol suite in the space provided below: [1 M]

TCP / IP protocol suit is as depicted below:

4) Depict a typical IP version 4 header in the space provided below with no. of bytes for each entity of the header. [2 M]

IPv4 header:

[Please Turn Over]

5) "FDDI cannot operate over multimode fiber systems" – Specify whether the statement is "True" or "False" and justify your answer. [1 M]

The statement above is: _____ (write True or False)

Justification: _____

_____

6) FDDI MAC protocol handles 2 category types of traffic as below: [2.5 M]

I. _____; which has _____ delay requirement.

II. _____; which has a _____ greater delay tolerance as it handles primarily many types of _____ data traffic.

7) Ethernet Protocol (the original standard IEEE 802.3) was defined for a _____ (choose one of the three: bus/token/star/hybrid)-based _____ choose one of the three: fibre/coaxial cable/free-space/copper line) LAN in which terminal transmissions are broadcast over the _____ medium using _____ (choose one from the three: CSMA/ CSMA-CD/any type of technique) for the MAC protocol. [1.5M]

8) List any two of the 3 sub-layers within ATM Adaptation Layer (AAL) and indicate its function [1 M]

A) _____ sub-layer with function:_____

_____

B) _____ sub-layer with function:_____

_____

9) [1 M]

A) Wireless LANs comply with the IEEE standard No. ____.___ and the same has been established with its operational compliance at _____ Layer of the OSI Model

B) Wireless LANs operate at the various frequency bands within U.S.

i) Industrial: _____ - _____ MHz

ii) Scientific: _____ - _____ GHz

iii) Medical: _____ - _____ GHz

****) ALL THE BEST(****

ID No. _____ Name: _____ **A**

BITS Pilani, Dubai Campus, Dubai International Academic City, Dubai

III Yr. B.E. (Hons.) Second Semester Academic Year 2013 – 2014

Communication Networks: QUIZ - 1 (Closed Book)

Course No. : **ECE C394 / ECE F343** Date : 19.03.2014
Duration : 20 min. (12:10PM-12:30PM) Max Marks : 14
Weightage : 7%

Note: 1. Answer all Questions with MOST Appropriate Responses
2. Use reverse side of each sheet for your rough work, if any.

- - -

1) Header of a Frame is to consist of four 16-bit binary words: b_0=1111 1111 1111 1111, b_1=1111 1111 0000 0000, b_2=1111 0000 1111 0000, b_3=1100 0000 1100 0000. The Internet Checksum for this code is: _____. [2 M]

Spare for your working:

2) CRC/polynomial code's generator polynomial, $g(x)=x^3+x+1$. Assuming that the information bit sequence, i(x) is: 1001,
A) _____ is the Code word [1 M]

Space for working:

B) When receiver does error checking, _____ are the CRC bits it obtains if during transmission 1st bit in the code word (as in A, above), has gone in error. [1 M]

Space for working:

3) _____ is the relationship between the Average time E[T] spent, by a packet in a communication network/system, packets' arrival rate, λ and the average number E[N] of packets in the system; when a communication network/system is modeled as a _____ ; This relationship is called_____. [1.5M]

4) Interpret a queuing model specification given as: D/G/2/<blank> in terms of the following: [1M]
A) D: _____ process is _____
B) G: _____ follow a _____
C) 2: implies _____
D) A <blank> in the fourth field implies: _____

[Please Turn Over]

5) A basic queuing model for a Multiplexer, studied as part of the course, allows one to account for the following 5 different aspects (in designing it as a communication network architectural element): [2.5]

I. _____

II. _____

III. _____

IV. _____

V. _____

6) A 1 Mbyte file is to be transmitted over a 1 Mbps communication line that has a bit error rate of $p=10^{-6}$. [0.5+0.5+1.5+1=3.5M]

A) _____ is the probability that the entire file is transmitted without errors.

B) If file is broken up into N-equal-sized blocks and transmitted separately, _____ is the probability that all the blocks arrive error-free.

C) Suppose the propagation delay is negligible and Stop-and-Wait ARQ is employed. On the average _____ is the time it take to deliver the file if the ARQ transmits the entire file each time.

D) Neglecting overhead for the Header and CRC bits, on the average _____ is the time it takes to deliver the file if the ARQ transmits a block at a time assuming entire file is broken into 80 equal blocks.

7)

A) _____ is the maximum number of connections that can be supported at any given time in a 3-stage switch in which N=16, n=4 and k=2 i.e., it has 1st stage: four 4x2 switches; 2nd stage: two 2x2 switches and 3rd stage four 2x4 switches. [0.5 M]

Space for working:

B) In the 3-stage switch of (A) above, if k=10 instead of 2, will the switch be _____ (choose any one: blocking / non-blocking? – Justify your answer, in the space provide below: [0.5 +0.5=1 M]

_____

_____

****) ALL THE BEST(****