UNIVERSITI SAINS MALAYSIA

Semester II Examination
Academic Session 2009/2010

February/March 2010

EEE 521 – COMPUTER AND DATA COMMUNICATIONS NETWORKS

Time: 3 Hours

INSTRUCTION TO CANDIDATE:

Please ensure that this examination paper contains **ELEVEN (11)** printed pages and **SIX (6)** questions before answering.

Answer **5** questions.

Distribution of marks for each question is stated accordingly.

All questions must be answered in English.

1.   (a)   As a network administrator of your organization, you are assigned to distribute the IP addresses according to the respective departments. Initially, you were assigned an address of 80.168.128.0/20. As a network engineer, you are to design your organization's network utilizing CIDR classless notations with 9 departments having a separate subnetwork. In order to optimize the IP address usage, you are to exploit the subnets according to the given order. Because your network equipments are out-of-date, you **cannot utilize the IP subnet 0.**

- Subnet 1: Management subnet – 20 hosts
- Subnet 2:Engineering subnet – 17 hosts
- Subnet 3:Sales subnet – 23 hosts
- Subnet 4:Maintenance subnet – 18 hosts
- Subnet 5:Security subnet – 19 hosts
- Subnet 6:Supervision subnet – 27 hosts
- Subnet 7:Registrar subnet – 10 hosts
- Subnet 8: Student subnet – 9 hosts
- Subnet 9: Welfare subnet – 50 hosts

Obtain:

(i)   Determine the subnet addresses and subnet mask for each department

(ii)   Identify the range of IP addresses and broadcast addresses being used by each department

(iii)   Draw the suitable network connection using several routers

(13 marks)

(b)   Discuss the following statements:

      (i)   The definition and role of sockets for network programming

      (ii)   The similarities and differences between centralized computing and distributed computing

      (iii)   The differences between connection-oriented service and connectionless service

(12 marks)

2.   (a)   Given the following network connection.

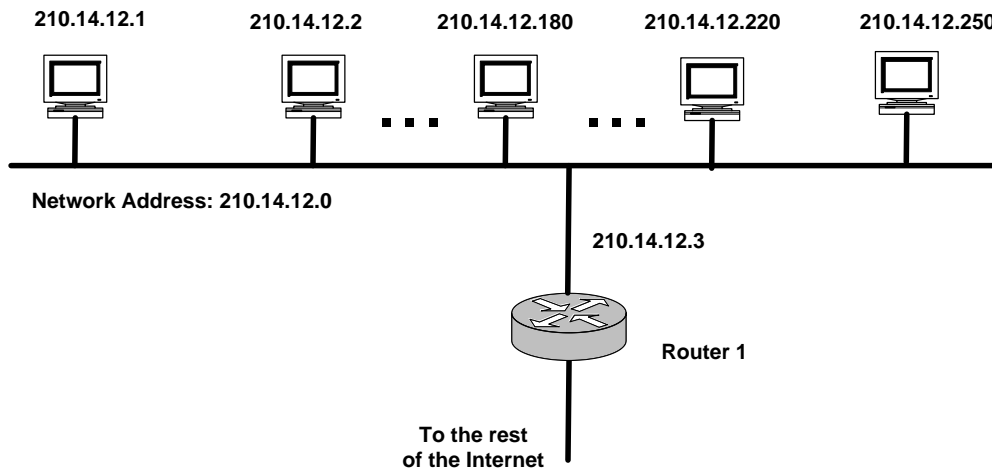
Figure 2 (a)

(i)   Reconfigure the network in Figure 2 with 250 hosts into 5 supernetworks each having 50 hosts. Redraw the appropriate network diagram using several routers along with the connected hosts and their range of IP address and broadcast address assignments.

(ii)   Revisiting Figure 2, reconfigure the network connection into 5 subnetworks. Redraw the appropriate network diagram using several routers along with the connected hosts and their range of IP address and broadcast assignments.

(19 marks)

(b)   Using an appropriate diagram, describe the TCP

(i)   Three way handshake sequence

(ii)   Termination of connection requests

(6 marks)

3.   (a)   Discuss the following protocols

(i)   Addresss Resolution Protocol (ARP)

(ii)   Reverse Address Resolution Protocol (RARP)

(iii)   Dynamic Host Configuration Protocol (DHCP)

(12 marks)
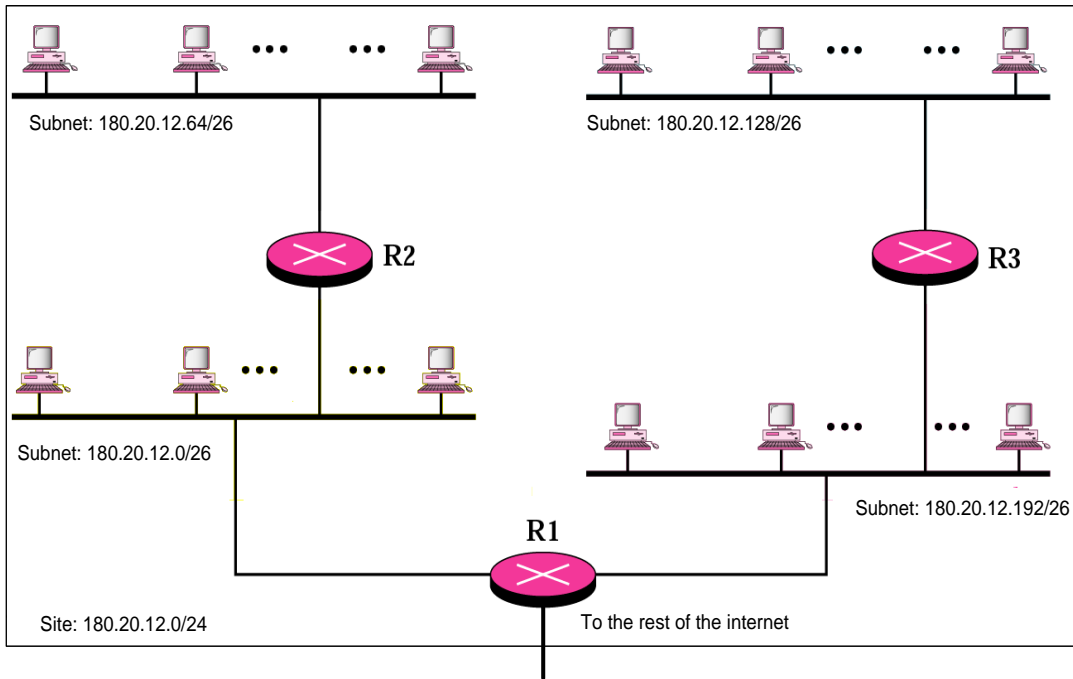
(b)　Consider the network diagram given in Figure 3 (b).

Subnet: 180.20.12.64/26

Subnet: 180.20.12.128/26

R2

R3

Subnet: 180.20.12.0/26

Subnet: 180.20.12.192/26

R1

Site: 180.20.12.0/24

To the rest of the internet

Figure 3 (b)

(i)　Identify the range of possible IP and Broadcast addresses for all the subnets

(ii)　The subnet 180.20.12.64/26 is to be subnetted into two more sub-networks. Using VLSM technique, identify the two sub-sub-networks addresses and the subnet mask along with the range of possible IP addresses.

(13 marks)

4.   (a)   Transmission Control Protocol (TCP) exploits the sliding window both at
             the sender and receiver.

             i)   Assuming the window size is 7, describe the case when the sliding
                   window slides, expands, and shrinks in order to support flow
                   control and error control.

             ii)   Describe the silly window syndrome. How does the Nagle and
                   Clark algorithm help address the silly window syndrome.

                                                                        (16 marks)

      (b)   Given the following diagram of the spanning tree bridge network,
             determine which bridges would be used in forwarding packets.
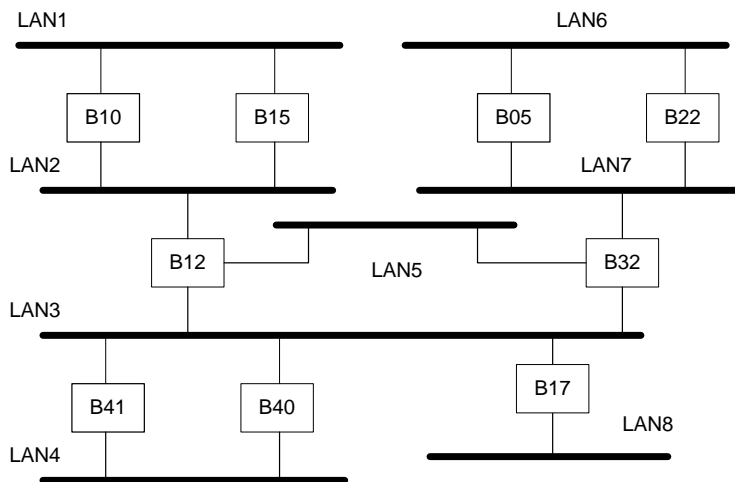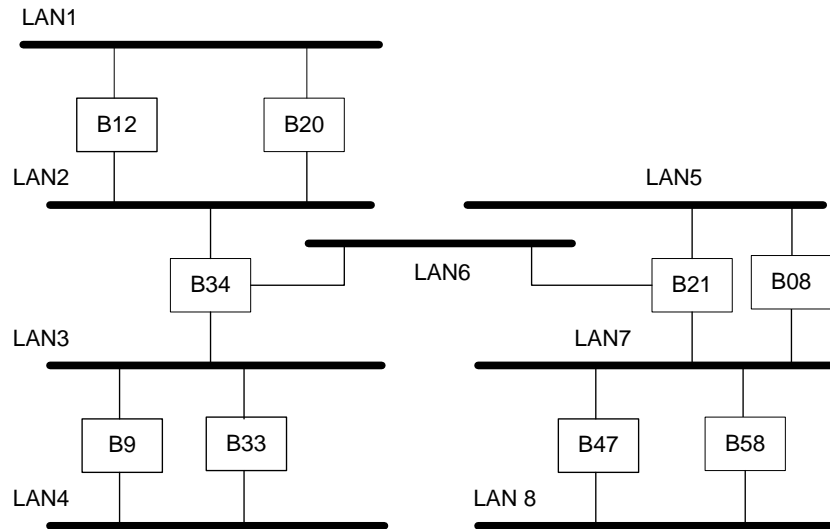
             (i)

Figure 4 (b) (i)
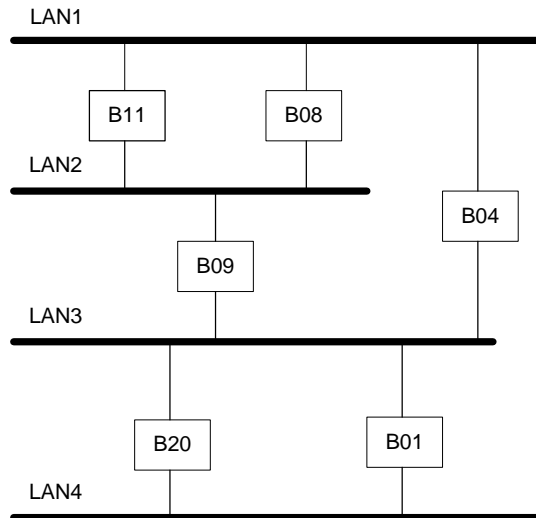
(ii)

Figure 4 (b) (ii)

(iii)

Figure 4 (b) (iii)

(9 marks)

5. (a) By using appropriate diagrams, describe the operation of Go-Back-N ARQ complete with its sliding window involving:

    (i) The frame is lost

    (ii) The acknowledgement is delayed

(8 marks)

(b) Discuss the following operations involving Linda based distributed shared memory.

    (i) The in operation, *in (tuple...)*

    (ii) The in non-blocking operation, *in_nb (tuple...)*

    (iii) The out operation, *out (tuple...)*

    (iv) The read operation, *read (tuple...)*

(8 marks)

(c)   Consider the current contents of the shared memory in Figure 5 (c).
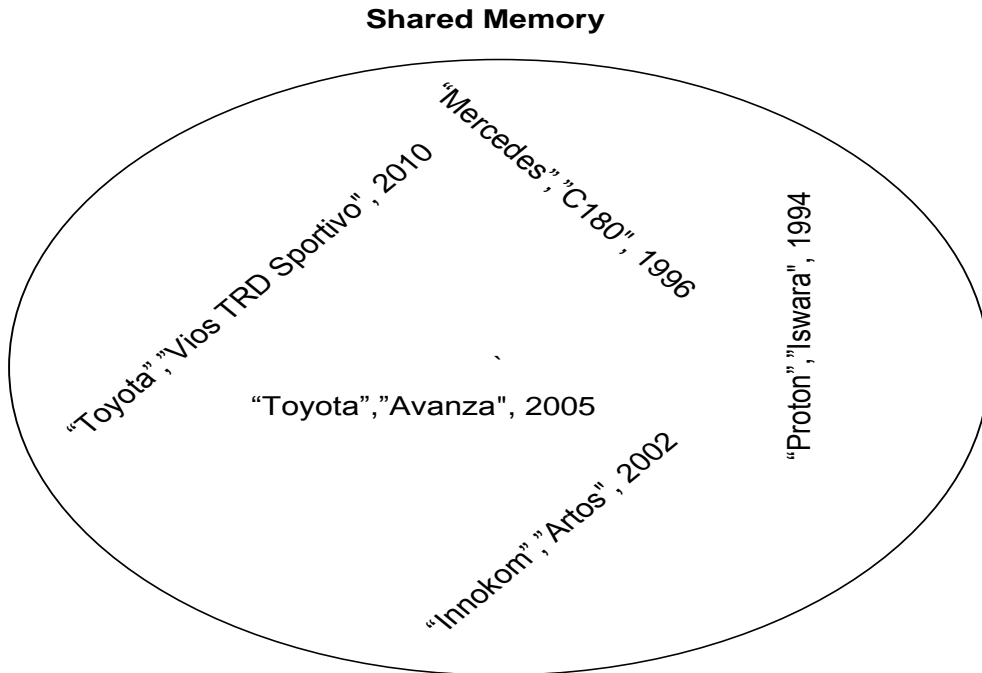
Shared Memory

Given the following atomic Linda operations, describe the contents of the shared memory in each instruction as well as highlight the current state of computation (i.e. blocking or non-blocking).

(i)   *…..*
       read ("Toyota","Avanza", 2005);
       in_nb ("Toyota","Avanza",2005);
       in ("Toyota",String,Integer);
       …..

(ii)   *…..*

out ("Proton","Iswara, 2005);

in_nb ("Toyota","Avanza",2005);

in   ("Toyota","Avanza",2005);

…..

(iii)   *…..*

read ("Innokom","Artos", 2002);

in ("Innokom","Artos",2002);

read ("Innokom","Artos", 2002);

…..

(9   marks)

6.   (a)   Discuss the main functions of the Java Networking Classes given in **bold** for UDP and TCP given in Figure 6 (a)

UDP ┌─────────────────┐ TCP
    │ Auxiliary class │
    └─────────────────┘
       InetAddress

┌──────────────────┐   ┌──────────────────┐
│ Java Classes Use │   │ Java Classes Use │
└──────────────────┘   └──────────────────┘

  DatagramSocket   **ServerSocket**
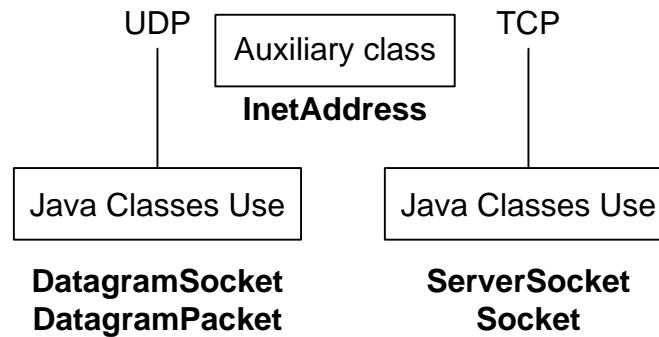 **DatagramPacket**   **Socket**

Figure 6 (a)

(9 marks)

(b)   Compare and contrast Transmission Control Protocol (TCP) and User Datagram Protocol (UDP).

(8 marks)

(c)   By assigning their functionalities into the appropriate TCP/IP layer, discuss the main functionalities of the following communication devices. By using an appropriate example, identify the broadcast and collision domains for each device.

(i)   Hub
(ii)   Bridges

(8 marks)

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