SIMON FRASER UNIVERSITY
SCHOOL OF ENGINEERING SCIENCE

Spring 2013
ENSC 427: COMMUNICATION NETWORKS

Midterm No. 1(a)
Wednesday, February 20, 2013

Duration: 50 minutes. Attempt all problems. Questions may not be equally weighted. Closed book and closed notes. Simple calculators (with no graphing/programming functions) are permitted. PDAs, laptops, and wireless phones are not permitted.
Please circle your answers.

1. **Applications and Layered Architecture**:
   Consider the OSI reference model. Application layer is the layer 7 of the OSI model. Select **all** statements that are **correct**:

   (a) Layers 2, 4, and 5 are Data Link, Session, and Presentation layers, respectively.

   (b) Layers 2, 4, and 6 are Data Link, Transport, and Presentation layers, respectively.

   (c) The main role of the Data Link layer is path determination while the main role of the Network layer is physical addressing.

   (d) The main role of the Network layer is path determination and one of the roles of the Transport layer is flow control.

   (e) Data units associated with layers 3, 4, and 5 are frames, packets, and segments, respectively.

   (f) Data units associated with layers layers 2, 3, and 4 are frames, packets, and segments.

2. **Applications and Layered Architecture**:
   Select **all** statements that are **correct**:

   (a) DHCP is an Application layer protocol.

   (b) DNS is an Application layer protocol.

   (c) ICMP is a Network layer protocol.

   (d) IPSec is a Network layer protocol.

3. **Applications and Layered Architecture**:
   Select **all** statements that are **correct**:

   (a) UDP is not connection-oriented.

   (b) TCP datagrams are sent immediately.

   (c) UDP provides the best-effort datagram service.

   (d) FTP uses only one TCP connection.

   (e) Traceroute is a utility used to determine if a host is reachable.

   (f) Netstat is a utility used to query a host about its TCP/IP network status.

4. **Applications and Layered Architecture**:
   Select **all** statements that are **correct**:

   (a) IP packets are routed according to the host name.

   (b) DNS provides conversion between host names and IP addresses.

   (c) Real-time Transport protocol (RTP) runs on top of TCP.

   (d) Peer-to-Peer applications are unable to connect users directly.

   (e) UDP retransmission is requested if an error is detected.

5. **Applications and Layered Architecture**:
   Select **all** acronyms that are **not correctly** expanded:

   (a) CRC: Cyclic Redundancy Check

   (b) DHCP: Dynamic Host Control Protocol

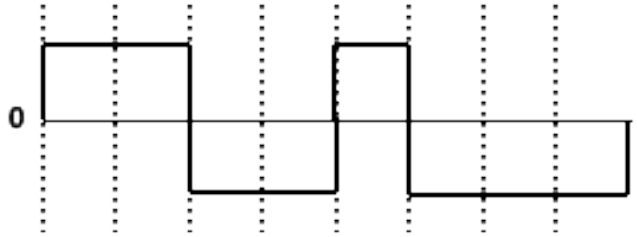
   (c) DNS: Domain Name Server

   (d) ICMP: Internet Control Message Protocol

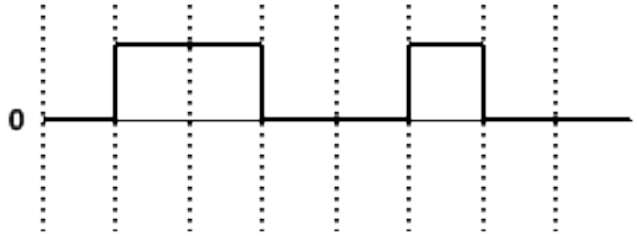
   (e) UDP: User Datagram Protocol

   (f) HTTP: Hyper Text Transport Protocol.

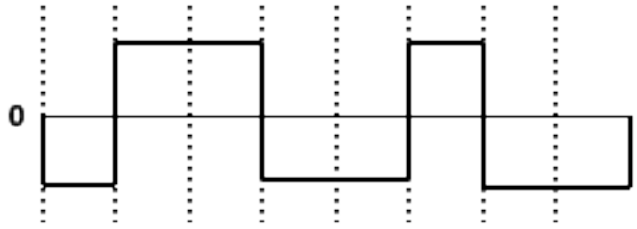
6. **Digital Transmission Fundamentals**:
   The ASCII code for the character "d" in decimal notation is 100. After converting this decimal number to binary, select the graph that shows character "d" using the Polar NRZ line coding.



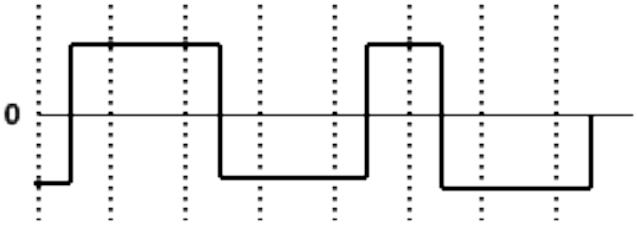
(a)



(b)



(c)



(d)

7. **Digital Transmission Fundamentals**:
   Identify the three modulation techniques shown below.

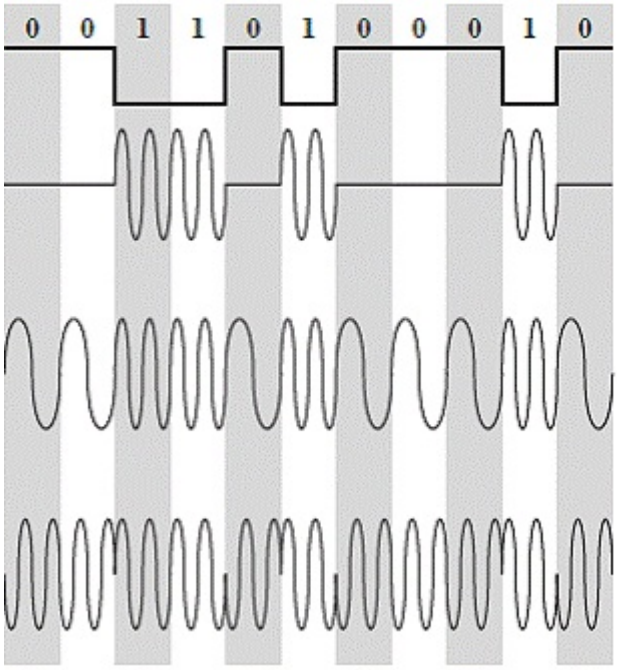
   (a) Frequency shift keying (top); Amplitude shift keying (middle); Dual-tone multi-frequency signalling (bottom).

   (b) Amplitude shift keying (top); Quadrature amplitude modulation (middle); Phase shift keying (bottom).

   (c) Phase shift keying (top); Amplitude shift keying (middle); Frequency shift key (bottom).

   (d) Quadrature amplitude modulation (top); Multi-frequency shift keying (middle); Phase shift key (bottom).

   (e) Amplitude shift keying (top); Frequency shift keying (middle); Phase shift keying (bottom).



8. **Case Study: Distributed Denial of Service Attacks**:
Considering the four main components of a distributed denial of service attack (DDoS): real attacker, control master program, attack daemon agents, and the victim. Select **all** statements that are **correct**:

   (a) The real attacker sends an attack command to the attacker daemon agent.

   (b) The attacker daemon begins the attack on the victim upon reception of an attack command.

   (c) The control master program monitors the attacks and reports to the attacker.

   (d) The control master program communicates with a set of attack daemons.

   (e) The control master program sends "execute" messages to the real attacker to notify the attacker that daemons are ready to execute attacks.

9. **Case Study: Distributed Denial of Service (DDoS) Attacks**:
Select **all** statements that are **not correct**:

   (a) Implementing queuing algorithms in network routers may protect users in case of DDoS attacks.

   (b) The drawback of the Class Based Queuing algorithm is that it does not guarantee bandwidth requirements under persistent denial of service attacks.

   (c) Implementation of a Class Based Queuing algorithm requires no additional effort.

   (d) Random Early Detection (RED) successfully provides limited bandwidth to legitimate users during a DDoS attack.

   (e) Filtering routes, disabling IP broadcast, and performing intrusion detection are among the available methods to defend users against attacks.

10. **NS-2 Tutorial**:
Consider the ns-2 code shown in page 6. Select **all** statements that are **correct**:

   (a) After the simulation ends, the network animator (nam) starts automatically and displays the network topology.

   (b) Traces to be used by *nam* are saved in a file called *out.nam*.

   (c) The "*$ns rtproto DV*" command selects a dynamic routing model for the simulation.

   (d) The simulated network topology consists of seven nodes.

   (e) Each node is connected to two other nodes.

   (f) The packet size varies throughout the simulation based on the employed protocol.

   (g) User datagram protocol is employed for packet transmission.

   (h) The packet transmissions starts when the simulation time reaches 0.005 s.

   (i) There is enough information to calculate the amount of data transferred during the simulation period.

   (j) Node "0" is the traffic source while node "3" is the sink.

```
set ns [new Simulator]

$ns rtproto DV

set nf [open midterm.nam w]
$ns namtrace-all $nf

proc finish {} {
        global ns nf
        $ns flush-trace
        close $nf
        exit 0
}

for {set i 0} {$i < 7} {incr i} {
        set n($i) [$ns node]
}

for {set i 0} {$i < 7} {incr i} {
        $ns duplex-link $n($i) $n([expr ($i+1)%7]) 1Mb 10ms DropTail
}

set udp0 [new Agent/UDP]
$ns attach-agent $n(0) $udp0

set cbr0 [new Application/Traffic/CBR]
$cbr0 set packetSize_ 500
$cbr0 set interval_ 0.005
$cbr0 attach-agent $udp0

set null0 [new Agent/Null]
$ns attach-agent $n(3) $null0

$ns connect $udp0 $null0

$ns at 0.5 "$cbr0 start"
$ns rtmodel-at 1.0 down $n(1) $n(2)
$ns rtmodel-at 2.0 up $n(1) $n(2)
$ns at 4.5 "$cbr0 stop"

$ns at 5.0 "finish"

$ns run
```

Code listing 1: The ns-2 code.