MCA-403: Network *Programming* (NS)
Master of Computer Applications
Semester IV, May 2017

Time: Three Hours **Max. Marks: 70**

I.

a. Write a function that return local hose's *IP* address. **(4)**

b. Write a code segment to handle zombies by using *a signal handler?* **(5)**

c. Write atode segment for server that creates one *TCP* port and a one *UDP port, and* waits on both of them using select. **(6)**

d. Write a TCPxlient and TCP server (concurrent) implementation *in C/C++*. Specification *of* the client and server are mentioned below: (5+5=10)

- Server is running a service on porr 9012.
- Client connects to that service *of* the server.
- Server prints the *IP* address and port number *of each* connected client.
- Client gets input (string) from user *and* sends it to the server.
- Server prints the string on its terminal and sends the same back to the client.
- Client receives the string and displays on the terminal.
- Client disconnects from the server.

2. Answer the following questions briefly (2^7=14)

a. If kernel chooses an ephemeral port number for our socket (we called bind() with port number field as 0), how can you obtain the value of port assigned?

b. Explain servent structure.

c. What happens when a router receives an IPv4 datagram whose size exceeds the outgoing link's MTU?

d. What are the different entities that comprise a socket pair?

e. How the port number allocated to a UDP client if it *does* not call bind().

f. We have two applications, one using TCP and other using *UDP. 4096* bytes are in the *receive* buffer for the TCP socket and two 2048-bye datagrams are in the receive buffer for the UDP socket. The TCP application calls *reod()* with the third argument of 4096 and UDP applicationcalls *recvfromf)* with third argument of 4096, Is there any difference?

g. Write output for the following program.

```
//include <stdio.h>
    Ainclude <sys/types.h>
    int main()
    {
        Pid_tpid = fork();
        if(pid == 0)
            printff'Child process created\n");
        else
            printffParent process created\n");
        returnO;
    )
```

3.

a. Draw the diagram to show connections between client host, resolvers and name server. (3)

b. What do you mean by connected UDP sockets? Does it start the 3WH5 process? What is the purpose of specifying Af_UNSPEC in address family of connect call in case of UDP sockets? (4)

c. What are wrapper functions? Write a wrapper Bind() that does proper error handling. (2+3=5)

d. What are socket send and receive buffers? Write a function to change the values of the low water marks of both the buffers. (2+3=5)

e. Assume that a client performs two writes: the first of 4 bytes and the second of 396 bytes. Also assume that the server's delayed ACK time is 100 ms, the RTT between the client and the server is 100ms, and the server's processing time for the client's request is 50ms. Draw a timeline that shows the interaction of Nagle Algorithm with delayed ACKs. Also draw the timeline chart if TCP_NODELAY socket option is set. (2.5 +2.5=5)

4.

a. Why do we need TIME_VJAIT State during termination of TCP connection? Briefly explain. (3)

b. Differentiate between network byte order and host byte order. How network byte order is converted to host byte order? (2+1=3)

c. With the help of a diagram show how actual packet exchange takes place for a complete TCP connection. Clearly show the various TCP states through which client and server passes. (3)

UNIX Nctwo[illegible]ogramrning IMCA 403)

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Time: 1 Hour

Max. Marks: 15

1. Briefly explain the sigmTivance of ba:[illegible]; parameter in listen system call. Why don't we specify a backlog of 0? **(2)**
2. In function const char [illegible], const veili Vddrptr. char +strptr, size_t len). What is the value of 'len' prv Riveter for IPV6 add ess and why? **(1+1=2)**
3. Consider a typical con.nr rent server wry doesn't the r lose of connfd by the parent terminate its connection with client? **(2)**
4. Write a wrapper Bindl) inat does proper error Handling **(2)**
5. What happens when a router receives an IPv4 datagram whose size exceeds the outgoing link's iviTu? **(2)**
6. Explain how socket address structure is pa:sed from kernel to process. **(2)**
7. What is a signal dispr mon? What are the choices for tf e disposition of s oftware interrupts? **(1+2=3)**

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1.

a. Write a TCP client and TCP server implementation in C/C++. **Specification** of the client and server are mentioned below: **(6+6=12)**

- Server is running a service on port 11002.
- Client connects to that service of the server.
- Server prints the IP address and port number of each connected client.
- Client gets an integer input from user and sends it to the server.
- Server calculates the factorial of the number and sends it back to client.
- Client then disconnects from the server.

b. Write a program for UDP echo client and server that verifies the returned socket address of who sent the reply and ignore any received datagrams that are not from the server the whom the client sent the datagram. **(8)**

c. Write a cllbnt side program that takes service name and hostname as command line arguments. Use predefined functions to convert service name and hostname into appropriate port number and ip address and use this information to establish the connection. **(6)**

d. Write a function *int sockfdjoJamily (int sockfd)* that returns the address family of a socket. **(4)**

2. Answer the following questions:

a. What are the different ways of setting RES_USE_INET6 resolver option? **(3)**

b. What do you mean by connected UDP sockets? What is the purpose of specifying AFJJNSPEC in address family of connect call in case of UDP sockets? **(3)**

c. What is the purpose of SO-REUSEADDR option? Explain. **(3)**

d. What happens when SO_LINGER socket option is called: **(1[redacted]*2F3)**

I. If l_onoff is nonzero and Ninger is nonzero.

II. If l_onoff is nonzero and 1Jinger is zero.

e. Explain 3-Way handshaking process with the help of diagram. **(3)**

3.

a. Compare the functions bcopyQ and memcopyQ. **(2)**

b. Explain why the function inet_addr() has been deprecated? **(2)**

c. Explain the scenarios where connect() returns an error. **(3)**

d. Briefly explain IPv6 Socket Address Structure. **(3)**

4.

a. What happens when select is called in the following cases? **(3)**

   I. If we specify the timeout argument as a null pointer.

   II. If we specify all three middle arguments (*readset, writeset and exceptset*) as null.

b. Compare blocking I/O model, non-blocking I/O model and I/O multiplexing model. **(4)**

c. Explain with an example why we need to use waitpid() instead wait() while writing the signal handler to avoid zombies. **(4)**

d. State the conditions under which a descriptor is ready for reading. **(4)**