CS241 SP15 Exam 7: Solution Key

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A VERSION OF THESE QUESTIONS MAY APPEAR IN A FUTURE QUIZ

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1. (1 point.) A student claims the following code fails to connect to a remote web server. Which response best describes the major bug in this code that causes this problem?

```
int setup_server() {
    struct addrinfo hints, *result;
    hints.ai_family = AF_INET;
    hints.ai_socktype = SOCK_STREAM;
    int sock_fd = socket(hints.ai_family, hints.ai_socktype, 0);
    if( getaddrinfo("www.illinois.edu", "80", &hints, &result) )
        return 0;
    if( connect(sock_fd, result->ai_addr, result->ai_addrlen) )
      return 0;
    return sock_fd;
    }
```

(A) The `hints` struct is not properly initialized

(B) The `hints.ai_socktype` should be set to SOCK_DGRAM

(C) Web servers don't listen on port 80

(D) The `connect` call is only used for TCP servers

(E) The `getaddrinfo` call is only used for TCP servers

2. (1 point.) Which is NOT true for sockets?

(A) Can be used for packet-based networking

(B) Can be used for stream-based networking

(C) Can be used for IPv6 streaming connections

(D) Can be used for IPv4 streaming connections

(E) Must be super-user (root) to create a socket

3. (1 point.) Which of the following system calls are occasionally used with both client and server sockets?

(A) Only `bind` ; `socket` and `accept` can only be used with server sockets

(B) None of the other responses are correct

(C) `bind` and `socket` but not `accept`

(D) `accept` and `socket` but not `bind`

(E) Only `accept` ; `socket` and `bind` can only be used with server sockets

4. (1 point.) What is the correct order of the "big 4" networking calls to initialize a server?

(A) socket, listen, accept, bind

(B) listen, socket, accept, bind

(C) socket, listen, bind, accept

(D) socket, bind, listen, accept

(E) accept, socket, bind, listen

5. (1 point.) A machine is used to process batch jobs where the execution time of each job is easily predictable. Which scheduling algorithm will provide shortest total wait time?

(A) Preemptive Shortest Job First

(B) Non-preemptive Priority

(C) Round Robin with a long time quanta

(D) Round Robin with a short time quanta

(E) Preemptive Priority

6. (1 point.) It takes 20ms for a packet to travel from client `X` to the server `yikyak.com` (and the same amount of time for a packet to be sent back to the client). How quickly can the client fully initialize a new TCP connection? i.e. How many milliseconds are required (starting from the moment the client sends the first packet) until the server can receive the first `data` packet?

(A) Minimum 60 ms (3-way-handshake)

(B) Minimum 20 ms (1-way-handshake)

(C) Minimum 50 ms (2.5-way-shake)

(D) Minimum 30 ms (Dual-duplex-handshake)

(E) Minimum 40 ms (2-way-handshake)

7. (1 point.) Riddle me this! I am a distributed service that can look up hosts for you. Give me a host name and I'll tell you their IP address(es)!

(A) DMS

(B) HHS

(C) HSS

(D) DDS

(E) DNS

8. (1 point.) Solve my riddle. Use me to attach a socket to a particular port on the host.

(A) accept

(B) attach

(C) socket

(D) bind

(E) listen

9. (1 point.) Which of the following is NOT a reason for a process (or thread) to be moved to the ready queue?

(A) The currently executing process calls `fork`

(B) A synchronization primitive (e.g. counting semaphore) is unlocked / released

(C) The currently executing process calls `exit(0)`

(D) A thread waiting on a condition variable is signaled

(E) A new TCP connection is fully initialized and `accept` can now return

10. (1 point.) I want to store the client's port number stored in a socket C structure in a text file where I will log (keep a note of) all of the incoming connections. Which C function should I use to correctly read the port data from the struct?

(A) ntohs

(B) portin

(C) htonl

(D) htons

(E) port2n

11. (1 point.) Pick the best response to complete the following, “Passive sockets are used ...”

(A) For listening server connections only

(B) For UDP clients

(C) For client connections only

(D) For system services

(E) For both client and server connections

12. (1 point.) Solve my riddle! I am an modern Internet addressing scheme. My addresses are 128 bits - so I'm perfect for everyone's Internet-connected wearables . There's no place like `::1`

(A) IPv5

(B) UDP

(C) IPv6

(D) IPv4

(E) TCP

13. (1 point.) Which one of the following is NOT true for the following call. Assume the call succeeds (returns zero)?

```
getaddrinfo("www.bbc.com","http", &aihints, &result);
```

(A) `result` points to a linked list of `addrinfo structs`

(B) Can be used with IPv6 connections

(C) `aihints` is used to specify the kind of connection desired (e.g. IPv4 , stream-based)

(D) May generate network packets due to the host name to IP address lookup

(E) Returns a valid connection to the web server at `www.bbc.com`.

14. (1 point.) Which scheduler(s) would cause a system to become completely unresponsive ('appear to deadlock/crash') if a background batch process entered an infinite loop?
Hint: FCFS = First come first served; RR = Round robin.

(A) "I refuse to answer that question on the grounds that I don't know the answer"

(B) FCFS and RR

(C) FCFS but not RR

(D) RR but not FCFS

(E) Neither RR nor FCFS

15. (1 point.) Four CPU intensive processes of equal priority, `PA PB PC PD`, enter the ready state at t=0. Process A requires 4 second of CPU, Process B requires 3 seconds of CPU, 2s of CPU for PC and 1s of CPU for PD. After 4 seconds, process A is 25% complete. Which response describes the most likely scheduler? Assume there are no other significant workloads. Assume a short-time quanta for RR

(A) SJF

(B) None of the other responses are correct

(C) RR

(D) FCFS

16. (1 point.) Which one of the following is NOT part of the TCP header?

(A) SYN bit

(B) ACK bit

(C) IP source address

(D) source port

(E) FIN bit

17. (1 point.) Which one of the following is NOT a feature of TCP?

(A) Packet re-ordering

(B) Simple error detection

(C) Encryption

(D) Flow control

(E) Packet re-tranmission

18. (1 point.) My IPv6 server program listens for TCP connections on port 2000 but fails when I try use port 1000 instead. Which of the following is the most likely explanation?

(A) Port numbers below 1024 are reserved for IPv4 connections

(B) Port numbers below 1024 cannot be used for incoming connections on IPv6

(C) Port numbers below 1024 are reserved for system tasks

(D) Ports numbers below 1024 can only be used by processes with root (admin) privileges

(E) Port numbers below 1024 can only be used for internal socket connections on the same host

19. (1 point.) Which algorithm below will have the shortest total wait time?

(A) Non-preemptive Priority

(B) Round Robin with a long time quanta

(C) Round Robin with a short time quanta

(D) Preemptive Priority

(E) Preemptive Shortest Job First

20. (1 point.) Which scheduling algorithm is expected to have the longest total wait time? You may assume that jobs have varied execution times and where appropriate, most jobs are longer than a system's time slice/time quanta.

(A) Round Robin

(B) First Come First Served

(C) All algorithms have the same longest total wait time.

(D) Preemptive Shortest Job First

(E) Shortest Job First

21. (1 point.) I want to create a cross-platform (Linux / MacOSX / other) server that can service multiple open pipe connections at the same time using a single thread. An appropriate design choice would be ... (choose the best response)

(A) `epoll` because it is cross-platform and supported on all POSIX systems

(B) `poll` because it is cross-platform and supports multiple threads

(C) `select` because it is cross-platform and supported on all POSIX systems

22. (1 point.) You are writing a linux-specific high-performance server that is designed to concurrently handle 10,000 long-lived connections. For the best performance you recommend ....

(A) `epoll`

(B) 10,000 processes (one per connection)

(C) `select`

(D) `poll`

(E) 10,000 threads (one per connection)

23. (1 point.) Riddle me this. What does the following describe? "A new process will be the next process to be run however my scheduler does not interrupt the current process until it has finished."

(A) Non-preemptive

(B) Turnaround

(C) Preemptive

(D) Interrupt scheduling

(E) Priority scheduling

24. (1 point.) Using Non preemptive priority scheduling, what is the last process to complete? In a tie-break, the newly arrived process is scheduled after rescheduling older jobs.

Process	Arrival time (ms)	Execution time (ms)	Priority
P1	0	40	Low
P2	0	40	High
P3	40	60	Low
P4	80	20	High
P4	100	20	High

(A) P2

(B) P4

(C) P1

(D) P3

(E) P5

25. (1 point.) Riddle me this! My processes exhibit poor I/O performance because my I/O intensive processes are usually waiting for another CPU-intensive process even though they only require a small amount of CPU time to continue. What am I?

(A) Example of I/O performance issues with Linux's completely fair scheduler

(B) Example of the convoy effect exhibited in FCFS scheduling

(C) Example of the bottleneck effect exhibited in priority scheduling

(D) None of the other responses are correct

(E) Example of the starvation effect exhibited in RR scheduling

26. (1 point.) Using preemptive Shortest Job First scheduling, determine the total wait time of the following processes. In a tie-break, the earliest arrived process is scheduled. Hint: SJF $\neq$ Shortest Remaining Time

Process	Arrival time (ms)	Execution time (ms)
P1	0	40
P2	10	10
P3	20	30
P4	30	20

Hint: Wait time = total time a process remains in the ready queue
Thus, Wait time for each process = $(Endtime - Arrivaltime - Executiontime)$

(A) 80 ms

(B) None of the other responses are correct

(C) 120 ms

(D) 100 ms

(E) 110 ms

Summary of answers:

Question	Correct Answer	Your Answer	Points
1	A	A	1
2	E	E	1
3	C	B	0
4	D	D	1
5	A	A	1
6	A	A	1
7	E	E	1
8	D	D	1
9	C	C	1
10	A	A	1
11	A	A	1
12	C	C	1
13	E	E	1
14	C	C	1
15	C	C	1
16	C	C	1
17	C	C	1
18	D	D	1
19	E	E	1
20	A	A	1
21	C	C	1
22	A	A	1
23	A	A	1
24	D	D	1
25	B	B	1
26	A	A	1
Total			25