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.) 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) htonl

(C) portin

(D) port2n

(E) htons

2. (1 point.) Solve my riddle. I may block if there's no new connections to your server; but don't fear, I will return as soon as someone connects!

(A) listen

(B) getaddrinfo

(C) socket

(D) accept

(E) bind

3. (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 process C and 1s of CPU for process D. Process B completes before process C. Which response describes the most likely scheduler? Assume there are no other significant workloads. Assume a 10ms time quanta for RR.

(A) FCFS

(B) None of the other responses are correct

(C) SJF

(D) RR

4. (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) FCFS and RR

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

(C) RR but not FCFS

(D) FCFS but not RR

(E) Neither RR nor FCFS

5. (1 point.) "I cannot get my IPv6 web server program to listen for HTTP requests on port 980"! Which one of the following is a valid explanation?

(A) You need root (admin) privileges to successfully run this program

(B) Port numbers below 1024 are reserved for kernel tasks not user programs

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

(D) Port numbers below 1024 are reserved for outgoing connections

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

6. (1 point.) Riddle me this! What is the best scheduler for the following system? My processes include occasional emergency maneuver calculations to avoid imminent collisions, recording heat signature sensor data and compressing large video logs.

(A) Preemptive Shortest Job First

(B) Non-preemptive Priority

(C) Round Robin with a short time quanta

(D) Round Robin with a long time quanta

(E) Preemptive Priority

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) HHS

(B) DMS

(C) DNS

(D) HSS

(E) DDS

8. (1 point.) Solve my riddle! I am a packet-based method of communication. Send the packet and forget! (I behave more like a letter than a phone call). Sometimes I get lost or duplicated along the way but I don't care if or when I arrive - that's your problem!

(A) TDP

(B) UDP

(C) TCP

(D) ODP

(E) ADP

9. (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) 110 ms

(B) 100 ms

(C) 80 ms

(D) None of the other responses are correct

(E) 120 ms

10. (1 point.) Which is NOT true for sockets?

(A) Can be used for packet-based networking

(B) Can be used for IPv4 streaming connections

(C) Can be used for IPv6 streaming connections

(D) Can be used for stream-based networking

(E) Creates two file descriptors (one for input one for output)

11. (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 `connect` call is only used for TCP servers

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

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

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

12. (1 point.) Which algorithm below will have the shortest total wait time?

(A) Preemptive Priority

(B) Preemptive Shortest Job First

(C) Round Robin with a short time quanta

(D) Round Robin with a long time quanta

(E) Non-preemptive Priority

13. (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) Turnaround

(B) Interrupt scheduling

(C) Priority scheduling

(D) Non-preemptive

(E) Preemptive

14. (1 point.) Which of the following system calls are occasionally used with both client and server sockets?

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

(B) None of the other responses are correct

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

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

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

15. (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 30 ms (Dual-duplex-handshake)

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

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

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

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

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

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

17. (1 point.) Which one of the following correctly describes the minimum network calls required to build a client to connect to a web server?

(A) getaddrinfo, socket, connect

(B) getaddrinfo, listen

(C) getaddrinfo, socket, listen, connect

(D) getaddrinfo connect

(E) getaddrinfo, socket

18. (1 point.) Which of the following is NOT a reason for a process (or thread) to be moved to the ready queue?

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

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

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

(D) The currently executing process calls `fork`

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

19. (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 the starvation effect exhibited in RR scheduling

(B) None of the other responses are correct

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

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

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

20. (1 point.) Which one of the following is NOT part of the TCP header?

(A) FIN bit

(B) source port

(C) ACK bit

(D) SYN bit

(E) IP source address

21. (1 point.) Pick the best response to complete the following, “Passive sockets are used ...”

(A) For system services

(B) For listening server connections only

(C) For UDP clients

(D) For client connections only

(E) For both client and server connections

22. (1 point.) Which one of the following is NOT a feature of TCP?

(A) Encryption

(B) Simple error detection

(C) Packet re-tranmission

(D) Flow control

(E) Packet re-ordering

23. (1 point.) Using Round robin scheduling, with a time quanta of 20 ms, calculate the response time of process 1. In a tie-break, the newly arrived process is scheduled before rescheduling older jobs. Assume all processes start generating output after 10 ms and complete their output at the end of their execution.

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

(A) 120 - 139 ms

(B) 20 ms or less

(C) 80 - 119 ms

(D) None of the other responses are correct

(E) 40-79 ms

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

(B) Can be used with IPv6 connections

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

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

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

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

(B) Preemptive Shortest Job First

(C) Shortest Job First

(D) First Come First Served

(E) Round Robin

26. (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) `poll`

(B) `epoll`

(C) `select`

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

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

Summary of answers:

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