BITS Pilani Hyderabad Campus

1st Sem 2020-21

Operating Systems CS F372 - Test 2 (Regular)

1. Consider the following code segment. Assume all the required header files have included.

```
1. int n = 0;
2. if (fork() == 0)
3.    printf("%d", ++n);
4. else
5.    printf("%d", ++n);
```

Which of the following is true?

a) Line 3 prints “1”, line 5 prints “2”
b) Line 3 prints “2”, line 5 prints “1”
c) Line 3 prints “1”, line 5 prints “1”
d) Line 3 prints “2”, line 5 prints “2”

2. Fill in the blanks: A process whose parent is dead is called a _____ process, and it is by the _____ process

a) zombie; init/systemd
b) orphan; init/systemd
c) zombie; parentd/motherd
d) orphan; parentd/motherd

3. Consider the following code segment. Assume all the required header files have included.

```
if (fork() == 0) {
      execlp("echo", "echo", "Hello World!", NULL);
      printf("Hello OS!\n");
}
else
      wait(NULL);
```

What is the likely output of the segment?

a) Hello World!
   Hello OS!
b) Hello World!
c) Hello OS!
   Hello World!
d) Hello World!Hello OS!

1. Consider the following code segment. Assume all the required header files have been included.

```
1. int n = 0;
2. if (fork() == 0)
3.    printf("%d", ++n);
4. else
5.    printf("%d", ++n);
```

   Which of the following is true?
   a) Line 3 prints “1”, line 5 prints “2”
   b) Line 3 prints “2”, line 5 prints “1”
   c) Line 3 prints “1”, line 5 prints “1”
   d) Line 3 prints “2”, line 5 prints “2”

2. Fill in the blanks: A process whose parent is dead is called a _____ process, and it is adopted by the _____ process
   a) zombie; init/systemd
   b) orphan; init/systemd
   c) zombie; parentd/motherd
   d) orphan; parentd/motherd

3. Consider the following code segment. Assume all the required header files have been included.

```
if (fork() == 0) {
      execlp("echo", "echo", "Hello World!", NULL);
      printf("Hello OS!\n");
}
else
      wait(NULL);
```

   What is the likely output of the segment?
   a) Hello World!
      Hello OS!
   b) Hello World!
   c) Hello OS!
      Hello World!
   d) Hello World!Hello OS!

4. msg_qs_writer.out is a binary which writes some lines of text to a message queue. msg_qs_reader.out is a binary which reads from the same message queue. The IPC_CREAT

flag is used by the writer, not by the reader. Consider the following timeline (Tn occurs before Tn+1):
T0: msg_qs_writer.out starts
T1: msg_qs_writer.out writes to the message queue
T2: msg_qs_writer.out exits
T3: msg_qs_reader.out starts
T4: msg_qs_reader.out attempts to read from the message queue
T5: msg_qs_reader.out exits
Which of the following options is correct?

a) The sequence would execute normally
b) There will be a segmentation fault at T4 because msg_qs_writer.out has exited
c) The execution would be waiting at T4 because the message queue is no longer available
d) None of the above

5. The following program uses a structure in a shared memory set up between a parent and a child process. The child should detect when the parent has finished writing using the status field (status = 1 indicates write is finished). It has some lines missing. Please choose one option which would complete the program. Assume that all the required header files have been included.

```
struct shmStruct{
      int status;
      char buf[30];
};

int main()
{
      int shmid;
      struct shmStruct *ss;
      int n;
      if (fork() == 0) {
            shmid = shmget(2041, 32, 0);
            A
            B
            printf ("\nChild Reading ....\n\n");
            for (n = 0; n < 26; n++)
                  putchar(ss->buf[n]);
            putchar('\n');
      }
      else {
            shmid = shmget(2041, 32, 0666 | IPC_CREAT);
            C
            ss->status=0;
            for (n = 0; n < 26; n++)
                  ss->buf[n] = 'a' + n;
            printf ("Parent Writing ....\n\n") ;
            for (n = 0; n < 26; n++)
                  putchar(ss->buf[n]);
            putchar('\n');
            D
            wait(NULL);
      }
      return 0;
}
```

a) A ≡ ss = shmat(shmid, 0, 0);

B ≡ while(ss->status == 0);
C ≡ ss = shmat(shmid, 0, 0);
D ≡ ss->status = 1;

b) A ≡ ss = shmat(shmid, 32, 0);
B ≡ while(ss->status == 0);
C ≡ ss = shmat(shmid, 32, 0);
D ≡ ss->status = 1;

c) A ≡ ss = shmat(shmid, 32, 0);
B ≡ while(ss->buf == 0);
C ≡ ss = shmat(shmid, 32, 0);
D ≡ ss->status = 0;

d) A ≡ ss = shmat(shmid, 0, 0);
B ≡ while(ss->status == 1);
C ≡ ss = shmat(shmid, 0, 0);
D ≡ ss->status = 0;

6. Consider the following code segment:

```
int main() {
      int pfds[2];
      char buf[1000];
      pipe(pfds);
      if (!fork()) {
            for (int i=0; i<10; i++) write(pfds[1], "child", 5);
      } else {
            for (int i=0; i<1; i++) write(pfds[1], "parent", 6);
            read(pfds[0], buf, 500);
            printf("%s", buf);
            wait(NULL);
      }
      return 0;
}
```

Which of the following is a possible output from line 10? Assume that all the required header files have been included.

a) segmentation fault
b) parent
c) child
d) Error because two processes can't write to the same end of the pipe simultaneously

7. Fill in the blank:

_____ are given exclusive access to the shared object to avoid difficulties in readers – writers problem.

a) readers and writers
b) readers
c) writers
d) None

8. A procedure defined within a _____ can access only those variables declared locally within the _____ and its formal parameters.
   a)semaphore ,Mutex
   b) Mutex,Mutex
   c) Mutex,monitor
   d)Monitor,Monitor

9. The portion where the monitor must always be in main memory and available is referred to as
   a) Memory monitor
   b) Control monitor
   c) Resident monitor
   d) None of the Above

10. There are four shared data variables inside a monitor. How many waiting queues are required for the monitor to allow the tasks to operate on the variables?
a) Monitor doesn't allow more than one task at a time inside it.
b) 2 (one for wait and other for signal operation)
c) 4 queues
d) none of the Above.

11. P1 =8 , p2= 7 ,p3= 2 are three processes whose remaining cpu bursts are indicated while p0=3 is currently under execution. Which among the following cpu scheduling algorithms is more relevant? All the processes are of the same priority.
    a) Round Robin algorithm
    b) Preemptive algorithm
    c) Shortest job first
    d) Preemptive shortest job first

12. Two processes have their cpu bursts as p1=5 and p2 = 5, with equal priority are to be scheduled for execution. The appropriate scheduling algorithm is
    a) Preemptive shortest job first algorithm
    b) Shortest job first algorithm
    c) First come First served algorithm
    d) Last in Last out Algorithm

13. A priority scheduling Algorithm can be

    a) Either pre-emptive or non-pre-emptive
    b) Pre-emptive only
    c) Non Pre-emptive only
    d) None of the above

14. What is the correct formulas for Turnaround Time (TAT) and Waiting time (WT) in CPU Scheduling?
    a. (TAT = Burst time + arrival time) && (WT = arrival time – Burst time)
    b. (TAT = Exit time - arrival time) && (WT = TAT – Burst time)
    c. (TAT = Response time – waiting time) && (WT = TAT + Burst time)
    d. (TAT = Exit time + Waiting time) && (WT = Burst time – Exit time)

15. Which one of the following is correct?
    a. FCFS scheduling algorithm is specific to only non-preemptive policy
    b. SJF scheduling is implemented with non-preemptive policy
    c. Waiting for jobs to complete is critical in SJF scheduling
    d. None of the above

16. Which one of the following is correct for nice value and global priority?
    a. A nice value of -20 is the lowest priority and it maps to the global priority of 100
    b. A nice value of -20 is the lowest priority and it maps to the global priority of 139
    c. A nice value of -20 is the highest priority and it maps to the global priority of 100
    d. A nice value of -20 is the highest priority and it maps to the global priority of 139

17. Which one of the following is correct?

    a. Peterson's solution is restricted to two processes
    b. The two processes in Peterson's solution share more than one data item
    c. One of the data items used in Peterson's solution is a Boolean data type
    d. All of the above

18. Consider the Petersons' solution and let us denote that the process P_i wishes to the enter the critical section. Which of the following is correct?

a) P_i first sets flag[i] to be true and then sets turn to the value j
b) P_i first sets flag[i] to be false and then sets turn to the value j
c) P_i first sets turn to the value j and then sets flag[i] to be true
d) P_i first sets turn to the value j and then sets flag[i] to be false

19. Which one of the following is not correct?

a) A preemptive kernel is more suitable for real-time programming than nonpreemptive kernel
b) A preemptive kernel may be more responsive than nonpreemptive kernel
c) Preemptive kernel is free from race conditions on kernel data structures
d) Preemptive kernel are difficult to design for SMP architectures

20. What is the right definition of signal () for semaphore S ?
a. signal(S){S++};
b. signal(S){S--};
c. signal(S){wait(S++)};
d. signal(S){wait(S--)};

21. Consider the following scenario. There is a Tattoo shop with one Tattoo artist, one chair used by the artist for his work where he draws Tattoo for his customer and n chairs for the waiting customers. Note that when there is no customer, the Tattoo artist sleeps in his own chair. When a customer arrives, he has to wake up the Tattoo artist. If there are many customers and the Tattoo artist is busy with one, then the remaining customers either wait if there are empty chairs in the waiting room or they leave if no chairs are empty. How many Semaphores are required to implement the process synchronization so that his shop functions properly?

a. 2
b. 3
c. 4
d. 5

22. A binary Semaphore was initialized to 12. After this 4P (wait) and 4V (Signal) operations were computed on this semaphore. What is the result?

a. 12
b. 8
c. 4
d. None of the above

23. Consider that a Process P1 and another Process P2 are the only competing processes on a uniprocessor system and they arrive at the same time. P1 is computing the roots of an order 4 equation and P2 is downloading a file from the web. Which of these algorithms is likely to be most efficient in terms of the CPU usage and not lead to starvation for any process?
    a. Round Robin with fixed quantum
    b. FCFS
    c. Shortest Remaining Time First
    d. All of the above

24. Two threads TA and TB want to modify a variable bank_balance as shown. The variable bank_balance holds the balance in a user's bank account:

```
1. int bank_balance = 1;
2. create_threads_with_this_code {
3.    if (bank_balance > 0)
4.    bank_balance--;
5. }
```

Which of these scheduling will result in an inconsistent state? (TA/TB denotes the thread and the number denotes the line number in the above code)

a. TA3, TB3, TA4, TB4
b. TA3, TA4, TB3, TB4
c. TB3, TB4, TA3, TB4
d. All of the above

25. Which of these characteristics enables the test_and_set() instruction to solve the critical section problem?
    a. It is atomic
    b. It treats the system as uniprocessor
    c. It has very low CPU overhead
    d. It is usable by high level languages like Python

26. Let us assume that there are four processes P1, P2, P3 and P4. The burst times for P1, P2, P3 and P4 are 4,8,6,9, respectively. Let us also assume that if we use SJF scheduling for these processes, the average waiting time is *w*. Now, instead of SJF, if we use FCFS scheduling algorithm, which arriving order of processes will give us a waiting time less than *w*?
    a. P1, P2, P3, P4
    b. P2, P3, P1, P4
    c. P4, P1, P2, P3
    d. None of the above.

27. Let us assume that the priority values range from 127 (low) to 0 (high). Further, let us also assume that we have a process with an initial priority of 127. It is known that this process takes 32 hours to age to have a priority 0. As a part of this aging technique, which one of the following is correct?
    a. Priority of a process is increased by 1 every 15 minutes
    b. Priority of a process is increased by 1 every 30 minutes
    c. Priority of a process is increased by 1 every 45 minutes
    d. Priority of a process is increased by 1 every 75 minutes

28. Which one of these is not a part of Little's formula?
    a. queue length
    b. waiting time
    c. arrival rate
    d. burst time

29. Which of these terms is not associated with thread cancellation?

    a. Target thread
    b. Asynchronous cancellation
    c. Deferred cancellation
    d. Thread Duplicate

30. You are given 5 processes P1, P2, P3, P4 and P5 with burst times 10, 29, 3, 7, 12, respectively. What is the average waiting time with RR scheduling algorithm given quantum=10?

    a. 28
    b. 23
    c. 18
    d. 32