Test

Operating System

Time: 60 min.

Directions for questions 1 to 30: Select the correct alternative from the given choices.

1. A program is _____ entity, while a process is _____ entity.
(A) Active, passive
(B) Active, sometimes active
(C) Passive, active
(D) Both (B) and (C)

2. All the information associated with a specific process is contained in:
(A) Process control block
(B) Program control block
(C) TLB
(D) Heap

3. Kernel-level threads and user-level threads are supported, respectively, by _____.
(A) Operating system and operating system
(B) Operating system and user
(C) User and user
(D) None of these

4. Which of the following is false about user-level threads?
(A) User-level threads are visible to the programmer and are unknown to the Kernel.
(B) These are faster to create.
(C) Kernel never interferes.
(D) There is no effect of a system call () on process.

5. Which of the following interprocess communication models are implemented using system calls?
(A) Shared memory
(B) Message passing
(C) Both (A) and (B)
(D) Neither (A) nor (B)

6. Peterson's solution
(i) is restricted to two processes
(ii) share two data items turn and flag [i]
(iii) mutual exclusion is achieved
(iv) is a hardware solution

Which of the above are true?
(A) (i), (ii), (iii)
(B) (ii), (iii), (iv)
(C) (iv), (i), (ii)
(D) (i), (ii), (iii), (iv)

7. Which of the following requires a mode switch from one thread to another?
(A) One process multiple thread
(B) User-level thread
(C) Kernel-level threads
(D) Both (B) and (C)

8. When a process is created, its state is
(A) New
(B) Ready
(C) Block
(D) Suspend

9. The data section of a process in memory contains
(A) Local variables, function parameters
(B) Return addresses
(C) Global variables
(D) None of the above

10. Which one of the following is true about process states?
(i) A process which is running must have terminated as next state.
(ii) From running state process can go to either waiting, ready or terminated state.
(iii) Only one process can run at any instant.
(iv) Ready process can go to waiting state.

(A) (i), (ii), (iii)
(B) (ii) and (iii) only
(C) (i) and (iv) only
(D) (ii), (iii), (iv)

11. Message passing model of inter process communication can be
(A) Blocking only
(B) Blocking and non-blocking
(C) Synchronous and asynchronous
(D) Both (B) and (C)

12. The definition of wait( ) is as follows:

```
wait (S) {
while (S <=0);
S - - ;
}
```

The semicolon after while statement, signifies
(A) Infinite looping
(B) Blank statement
(C) Depends on interpretation of compiler
(D) No operation

13. To avoid race condition, the number of processes using the critical sections is/are:
(A) 1 (B) 2
(C) 3 (D) More than 3

14. The 'Critical Section' is the region in which
(A) Any number of processes can enter without any permission
(B) Only one process enters at a time and others wait for it.
(C) Section is very critical
(D) None of these

15. What does process control block contain?
(A) Process Identification
(B) Process state information
(C) Process control information
(D) All of the above

16. Match the following

(i) Multiprogramming	(x) Managing multiple processes executing on multiple computers
(ii) Multiprocessing	(y) Management of multiple processes within a uniprocessor system.
(iii) Distributed process Management	(z) Management of multiple processes within a multiprocessor.

(A) (i) –y (ii) –z (iii) –x
(B) (i) –z (ii) –x (iii) –y
(C) (i) –y (ii) –x (iii) –z
(D) Ambiguous

17. For 'n' number of fork( ) system call, how many parent and child processes will be created?
(A) 1, $2^n - 1$, respectively
(B) 1, 2^n, respectively
(C) $2^n - 1$, 1, respectively
(D) n, $2n$, respectively

18. If the value of binary semaphore is initialized with 1 and three wait( ) operations are performed, how many processes are there in the block list?
(A) 1 (B) 0
(C) 3 (D) 2

19. A counting semaphore is initialized with the value 3. A list of 'P' and 'V' operations are performed on the semaphore as: $1P$, $2V$, $2P$, $3V$, $5P$, $7V$, $2P$, $3V$.
The final value of semaphore is?
(A) 5 (B) 8
(C) 7 (D) 6

20. The final value of semaphore after 10 'P' operations and 23 'V' operations is 1. What will be the initial value of this counting semaphore?
(A) –14 (B) –13
(C) –12 (D) –11

21. For a machine-instruction approach to enforce mutual exclusion, following are its properties:
(i) starvation and deadlock free
(ii) it is applicable to any number of processes.
(iii) it can be used to support multiple critical sections, each defined by its own variable.
(iv) it is simple, easy to verify and employed with busy waiting

Which of the above is false?
(A) (iv) only (B) (ii), (iii) only
(C) (i), (ii) only (D) (i) only

22. Consider the following code:

```
if (fork( ) == 0)
{
a = a + 5;
printf("%d,%d\n",a,&a);
}
else
{
a = a – 5;
printf("%d,%d\n",a,&a);
}
```

Let p, q be the values printed by the parent process, and s, t be the values printed by the child process. Which one of the following is true?
(A) $p = s + 10$ and $q = t$
(B) $p = s + 10$ and $q \uparrow t$
(C) $p + 10 = s$ and $q = t$
(D) $p + 10 = s$ and $q \uparrow t$

23. Consider the following statements with respect to user-level threads:
(i) Context switch is faster with kernel-supported threads.
(ii) For user-level threads, a system call can block the entire process.
(iii) Kernel-supported threads can be scheduled independently.
(iv) User-level threads are transparent to the Kernel.

Which of the above statements are true?
(A) (i), (iii) and (iv) only
(B) (ii) and (iii) only
(C) (i) and (iii) only
(D) (i) and (ii) only

24. Suppose there are 'n' CPUs and 'm' processes such that $m > n$. What will be the minimum and maximum number of ready, running and blocked process, respectively?
(A) 0, 0, 0 and m, n, m (B) 1, m, 1 and n, n, n
(C) m, 1, 0 and m, m, n (D) 0, 0, 0 and n, m, m

25. Consider the following signal semaphore code signal (semaphore *s)

```
{
s.value++;
if( ____(I)____ )
{
   remove a process P from S.list;
   ____(II)____
   }
}
```

Choose the suitable options for (I) and (II), respectively
(A) S.value = 0 and wakeup(P);
(B) S.value <= 0 and wakeup(P);
(C) S.value <0 and block( );
(D) S.value <= 0 and block( );

26. Consider the methods used by processes P_1 and P_2 for accessing their critical sections whenever needed. The initial values of shared Boolean variables S_1 and S_2 are randomly assigned.

Method used by P_1

While ($S_1 == S_2$);
Critical section
$S_1 = S_2$;

Method used by P_2

While ($S_1 != S_2$);
Critical section
$S_2 = !(S_1)$;

Which of the following statements describes the properties achieved?

(A) Mutual exclusion but not progress
(B) Progress only
(C) Bounded waiting, progress
(D) Mutual exclusion, progress, bounded waiting

27. Consider the following statements regarding spin locks:

(i) No context switch is required when a process wait on a lock
(ii) Spin locks are useful when locks are expected to be held for short times.
(iii) They are often employed on multiprocessor systems
(iv) Process 'spins' while waiting for a lock

Choose the correct option:

(A) (i), (ii), (iii), (iv) are true
(B) Only (i) and (ii) are true
(C) (iii) is false
(D) (ii) is true and (iv) is false

Common data for questions 28, 29 and 30: From the Readers-Writers problem, the data structure for reader process is:

```
semaphore mutex, wrt;
int readcount;
while(1)
{
wait(mutex);
readcount++;
if(readcount == 1)
wait(wrt);
signal(mutex);

_ _ _ _ _
_ _ _ _ _
wait(mutex);
readcount - -;
if(readcount ==0)
signal(wrt); signal(mutex);
}
```

mutex and wrt are initialized to 1 and readcount is initialized to 0.

28. Mutual exclusion for readers is attained by

(A) Wrt
(B) Mutex
(C) Readcount
(D) Both (A) and (B)

29. Which of the following semaphore or semaphores is used by the first or last reader that enters or exits the critical section?

(A) Wrt
(B) Mutex
(C) Readcount
(D) Both (A) and (B)

30. The readcount variable keeps track of how many processes are _____.

(A) Currently reading the object
(B) Currently writing the object
(C) Waiting in the queue
(D) Reading the shared data

Answer Keys

1. C	**2.** A	**3.** B	**4.** D	**5.** B	**6.** A	**7.** C	**8.** A	**9.** C	**10.** B
11. D	**12.** D	**13.** A	**14.** B	**15.** D	**16.** A	**17.** A	**18.** D	**19.** B	**20.** C
21. D	**22.** D	**23.** B	**24.** A	**25.** B	**26.** A	**27.** A	**28.** B	**29.** A	**30.** A