Branch : CSE/IT **Batch : Hinglish**

Operating System

Process synchronization / Coordination

DPP-04

[MCQ]

1. Consider the following program:

```
Bool Lock = False;
void Process (int i)
{
    while(1)
    {
    < Non-critical section >
    while(TSL(&Lock)= = True)
    < Critical Section >
    Lock = False;
    }
}
```

Which of the following are correct regarding given code?

(a) It guarantees mutual exclusion but not progress.

(b) It gurantees mutual exclusion and progress but not bounded waiting.

(c) It guarantees progress but not mutual exclusion.

(d) It guarantees progress and bounded waiting but not guarantees mutual exclusion.

[MSQ]

2. Which of the following is/are correct regarding "SWAP"?

(a) It is a software-based synchronization mechanism.

(b) It is atomic instruction.

(c) It is based on "Lock Key" mechanism.

(d) It is non-privileged instruction.

[MCQ]

3. Match the following:

1)	TSL	(i)	Mutual exclusion
2)	SWAP	(ii)	Progress
		(iii)	Bounded waiting

Which of the following option is correct?

(a) 1 – (i); 2 – (ii); 2 – (iii)

(b) 1 – (ii); 1 – (iii); 2 – (ii)

(c) 1 – (i); 2 – (i); 2 – (ii)

(d) 1 – (iii); 2 – (i); 1 – (i)

[MSQ]

4. Which of the following is/are correct?

(a) TSL has busy waiting and wastes CPU cycle.

(b) TSL suffers from priority - inversion.

(c) SWAP has busy waiting and utilizes CPU cycle efficiently.

(d) SWAP suffer from priority-inversion.

[MCQ]

5. Priority inversion problem can be solved by _______.

(a) Preemption.

(b) Priority Inheritance

(c) Preemption followed by priority exchange.

(d) No solution, and priority inversion problem can cause deadlock.

[MCQ]

6. Consider the following program of producer from producer-consumer problem implemented using sleep() and wakeup ().

```
void Producer(void)
```

```
{
    int itemp, in = 0;
    while(1)
    {
     itemp = Produce.item();
    X;
    Buffer [in] = itemp;
    in = (in + 1) % N;
    Count = Count + 1;
    Y
    }
}
```

What will be the value of X and Y respectively?

(a) X = if(count = = 1) sleep();
    T = if(count = = N) wakeup(consumer);

(b) X = if(count = = N) sleep();
    Y = if(count = = N -1) wakeup(consumer);

(c) X = if(count = = N) sleep();
    Y = if(count = = 1) wakeup(consumer);

(d) X = if(count = = N) wakeup(consumer);
    Y = if(count = = 1) sleep();

[MCQ]

7. Operations performed on semaphores are ________.

(a) Wait and signal
(b) Sleep and wakeup
(c) Increment and decrement
(d) All of the above.

[MSQ]

8. Which of the following are the types of semaphore?

(a) Binary
(b) Bounded
(c) Counting
(d) Incremental

Answer Key

1. **(b)**
2. **(b, c)**
3. **(c)**
4. **(a, b, d)**
5. **(b)**
6. **(c)**
7. **(a)**
8. **(a, c)**

Hints and solutions

1. **(b)**
The given program is of Test and Set lock instruction and it generates mutual exclusion and progress but it does not guarantee bounded waiting.

2. **(b, c)**
SWAP is hardware-based synchronization mechanism. It is privileged/atomic instruction.
It is a lock-based mechanism and has "Lock-key" mechanism.
So, option (b), (c) are correct.

3. **(c)**
Both TSL and SWAP guarantees Mutual Exclusion and progress but not bounded waiting.

4. **(a, b, d)**
TSL and SWAP both have busy waiting which wastes CPU cycle and they also has priority inversion.
Therefore (a), (b) and (d) are correct.

5. **(b)**
Priority inheritance is the solution to priority inversion problem.

6. **(c)**
Producer's program in
Producer-consumer implementation using sleep() and wakeup() is as follows:

```
void producer(void)
{
      int itemp; in = 0;
      while(1)
      {
      itemp = Produce.item();
      if(count = = N) sleep();
      Buffer[in] = itemp;
      in = (in + 1)%N
      count = count + 1;
      if(count = = 1) wakeup(consumer);
      }
}
```

Therefore, option c is correct.

7. **(a)**
wait and signal are operations performed on semaphores.

8. **(a, c)**
Semaphores are of two types.
Binary and counting.
In Binary semaphore the value is either 0 or 1.
Counting semaphore can take any value between $-\infty$ to $+\infty$.

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