Branch : CSE & IT Batch : English

Operating Systems

Process Synchronization/Coordination

DPP 06

[NAT]

1. A counting semaphore S is initialized to 2 then following sequence of operation are performed over S.
V V V P V P P P V P P V P V V P
What will be the value of S after operations?

[MSQ]

2. Recall the readers-writers problem. Consider the following solution to this problem.

```
Writer
Wait (wrt);
        .....
        writing is performed
        .....
        Signal (wrt);
Reader
        wait (mutex);
        readcount = readcount + 1;
        if readcount = 1 then wait (wrt);
        signal (mutex);
                .....
                Reading is performed
                .....
        wait (mutex);
        readcount = readcount – 1;
        if readcount = 0 then signal (wrt);
        signal (mutex);
```

Which of the following is/are correct reading above solution?

(a) Multiple readers can read together
(b) The reader are not starved of access because of priority of the writers and vice versa.
(c) A writer gets exclusive access, i.e., while a writer is writing. No one can write or read.
(d) Deadlock is possible.

[MCQ]

3. At a particular time of computation, the value of a counting semaphore is 9. Then 20 P operation and xV operations were completed on this semaphore. If the final value of the semaphore is 5, x will be?

(a) 19 (b) 18
(c) 16 (d) 20

[MCQ]

4. A counting semaphore is initialized to 5. Then, 15 P operations and 20 signal operations are performed on S. What will be the final value of S?

(a) 0 (b) 20
(c) 5 (d) 10

[MSQ]

5. Which of the following condition must be satisfied in the classical reader-writer problem?

(a) Only one writer may write a file at a time.
(b) Only one reader may read a file at a time.
(c) If a reader is reading a file, no writer may write to it.
(d) Any number of the reader can read at a time.

[MCQ]

6. A thread that is blocked on a semaphore is awakened when another thread:

(a) Tries to block the same semaphore
(b) Tries to decrement a semaphores value ≤ 0.
(c) Tries to increment the semaphore value ≥ 0.
(d) None of these

[MSQ]

7. The strict alternation _____.

(a) Does not guarantee bounded waiting
(b) Does not guarantee progress.
(c) Does not guarantee Mutual exclusion
(d) All of these

[MCQ]

8. The bounded buffer problem is also known as

(a) Readers – writing problem
(b) Producer – consumer problem
(c) Dining – Philospher problem
(d) None of these

Answer Key

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

Hints & Solutions

1. (2)

S = 2

V	V	V	P	V	P	P	P	V	P	P	V	P	V	V	P
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
3	4	5	4	5	4	3	2	3	2	1	2	1	2	3	2

2. (a, b, c)

The solution efficiently synchronizes multiple readers and writers such that multiple readers can read together but a writer gets exclusive access. This implements a solution to this problem and ensures the readers are not starved of access due to priority of the writers and vice versa.

3. (c)

Initial value of semaphore = 9
Signal operation = xV
Wait operation = 20 P
Final value = 5
So,
5 = 9 + x V + 20 P
5 = 9 + x (+1) + 20 (–1)
5 = 9 + x – 20
x = 5 – 9 + 20
x = 16

4. (d)

$5 - (15 \times 1) + (20 \times 1)$

$\Rightarrow 5 - 15 + 20$

$\Rightarrow 10$

5. (a, c, d)

For the classical reader-wirter problem, the following condition must be satisfied.

→ Any number of readers may simultaneously read a file.

→ If the reader is reading a file, no writer may write it.

→ If the writer is writing a file, no reader may read it.

→ Only one writer is allowed to write the file at a time.

6. (c)

A thread that is blocked on a semaphore is awakened when another thread tries to increment the till the semaphore value becomes equal to or above 0.

7. (b)

The strict alternation guarantees mutual exclusion and bounded waiting but does not guarantee progress. Therefore, option B is correct.

8. (b)

Producer consumer problem is also known as bounded buffer problem. It is a classical example of concurrent access to shared resource.