Branch : CSE & IT   Batch : English

Operating Systems
Process Synchronization/Coordination   DPP 09

[MCQ]
1. Which of the following can prevent deadlock in dining philosopher's problem?
   (a) Allow at most four philosophers' to be sitting simultaneously at the table.
   (b) Allow a philosopher to pick up chopsticks only if both chopsticks are available (to do this, they must pick them up in a critical section).
   (c) An odd-numbered philosopher picks up first left chopstick and then right chopstick, whereas an even-numbered philosopher picks up right chopstick and then left chopstick.
   (d) All of the above.

[MSQ]
2. Dining philosopher problem is ____.
   (a) Solution to producer-consumer problem.
   (b) Example of concurrency-control problem.
   (c) Application of semaphore.
   (d) Classical IPC problem.

[MSQ]
3. Which of the following statements is/are correct?
   (a) Concurrency is about doing multiple things at once.
   (b) Concurrency is about dealing with multiple things at once.
   (c) Parallelism is about doing multiple things at once.
   (d) Parallelism is about dealing with multiple things at once.

[MSQ]
4. Which of the following condition must be satisfy if two statements are concurrent/independent?

   (a) Atleast one shared variable should be present.
   (b) No shared variable should present.
   (c) Output of one statement should serve as input to other statement.
   (d) Output of one statement should not serve as input to other statement.

[NAT]
5. Consider the following precedence graph:
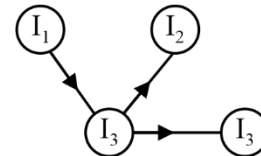
   How many nodes are dependent?

[MCQ]
6. Consider the following code by begin and end
   $a = 3$
   $b = 4$
   begin:
      $b = a * b$
      $a = a * b$
   end;
   What could be the possible final values of a, b?
   (a) a:{12}; b:{12}
   (b) a:{12}; b:{12, 24}
   (c) a:{12, 24}; b:{12}
   (d) a:{12, 36}; b:{12}

[MCQ]
7. How many of the following statements is/are not independent?
   $I_1: a = b + c$
   $I_2: c = d * e$
   $I_3: e = a * g$
   $I_4: g = e + m$
   $I_5: m = m + f$

[NAT]
8. Consider a counting semaphore variable 'X', following are the semaphore operations performed 20P, 6V, 8V, 7P, 12P, 16V. What will be the largest initial value of 'X' to keep 2 processes in suspended list?

Answer Key

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

Hints & Solutions

1. (d)

  (a) Allow at most four philosophers' to be sitting simultaneously at the table.

  (b) Allow a philosopher to pick up chopsticks only if both chopsticks are available (to do this, they must pick them up in a critical section).

  (c) An odd-numbered philosopher picks up first left chopstick and the right chopstick, whereas an even-numbered philosopher picks up right chopstick and then left chopstick.

2. (b, c, d)

Dining philosopher's problem is a classical IPC problem. Its solution can be implemented by using semaphore. It is an example of large class of concurrency control problems.

3. (b, c)

Concurrency is about dealing with lots of things at once. Parallelism is about doing lots of things at once.

Concurrency

Parallelism
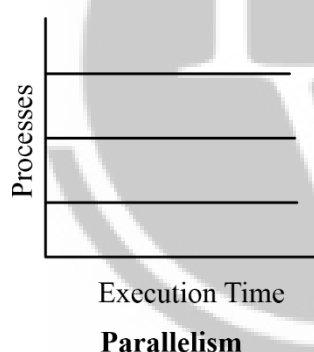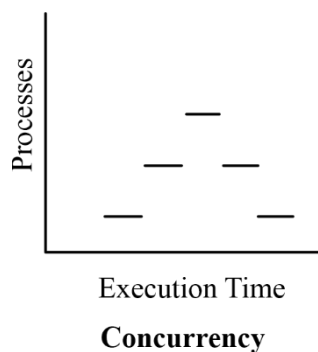
4. (b, d)

If two statements are concurrent or independent then

  (1) There should be no shared variable between then

  (2) Output of one statement should not serve as input to other statement

5. (3)

$I_1 \rightarrow I_3$; I_3 depends on I_1

$I_3 \rightarrow I_2$ and $I_3 \rightarrow I_4$; I_2 and I_4 depends on I_3

So, 3 nodes are dependent.

6. (d)

If first it execute $b = a * b \Rightarrow b = 3 * 4 = 12$

If first it executes $a = a * b \Rightarrow a = 3 * 4 = 12$

If first it executes $b = a * b$ and then $a = a * b$, then

$a = 3 * 12 = 36$

So, final possible values are $\left\{ \dfrac{12, 36}{a}, \dfrac{12}{b} \right\}$

7. (3)

$I_1 = a = b + c$

$I_2 = c = d * e$

Only these two statements are independent

I_3: $e = a * g$

I_4: $g = e + m$

I_5: $g = m + f$

These three statements are not independent

Therefore, 3 is correct.

8. (7)

$-2 = X - 20 + 6 + 8 - 7 - 12 + 16$

$-2 = X - 20 + 6 + 1 + 4$

$-2 = X - 20 + 11$

$-2 = X - 9$

$-2 + 9 = X$

$X = 7$