

Assignment 7

MCQ:

1. Match the following (by rules of saturation arithmetic with values ranging from -50 to 50)

a. $25*2$	1. 12
b. $10+2$	2. -35
c. $32-67$	3. 50
d. $(55+69)-(96+2)$	4. 0

- A. a-1;b-2;c-3;d-4
- B. a-3;b-1;c-4;d-2
- C. a-3;b-1;c-4;d-4
- D. None of the above

Solution: Option C. a-3;b-1;c-4;d-4

Explanation: a. $25*2 = 50$; b. $10+2 = 12$; c. $32-67 = 0$; d. $(55+69)-(96+2) = (50)-(50) = 0$

2. Which of the following circuit components are dark silicon friendly?

- A. Specialized logic cells
- B. Cache memory
- C. Both A and B
- D. None of the above

Solution: Option C. Both A and B

Explanation: These circuit components contribute to the overall performance of the IC by consuming power in special situations only. This has led to development of multi-core systems.

3. What kind of an RTOS will I use to build a missile system?

- A. Hard RTOS
- B. Soft RTOS
- C. Firm RTOS
- D. None of the above

Solution: Option A. Hard RTOS

Explanation: A hard RTOS guarantees critical tasks be completed within a time frame which is needed to build a missile system.

4. Which of the following statements are false about RTOS?

- A. They should be made predictable.
- B. The interrupts should be permanently disabled.
- C. All contiguous files should be on the disk.
- D. None of the above.

Solution: Option B. The interrupts should be permanently disabled.

Explanation: the interrupts should be temporarily disabled because the system becomes unpredictable if the interrupts are kept permanently disabled.

5. Which are the features of VxWorks Operating System?

- A. Multitasking kernel with fast interrupt response.
- B. Preemptive and Round robin scheduling.
- C. Both A and B
- D. None of the above.

Solution: Option C. Both A and B.

Explanation: Fact.

6. What is the mode bit of a privileged set of instructions?

- A. 0
- B. 1
- C. 2
- D. 3

Solution: Option A. 0

Explanation: A privileged set of instructions is always executed by the kernel for which the mode bit needs to be 0.

7. "In a CPU programmed with a non-preemptive scheduling scheme, interrupts can be handled while a process is running." Note: The CPU dedicates all its resources to the process in the running state.

- A. True
- B. False

Solution: Option B. False

Explanation: The CPU, having dedicated all its resources to the running process, waits for its completion before handling another process or an interrupt.

8. For a large number of tasks scheduled under the RMS algorithm, all of them can meet the deadlines if the CPU utilization is roughly under

- A. 50%
- B. 60%
- C. 65%
- D. 70%

Solution: Option D. 70%

Explanation: for an RMS algorithm, $u \leq n(2^{1/n} - 1)$; for n tends to infinity, u tends to $\ln(2) \approx 0.6931...$

9. What is the minimum number of variables to be shared to avoid the critical section problem?

- A. 1
- B. 2
- C. 3
- D. 4

Solution: Option B. 2

Explanation: In case of two shared variables, when some kind of preemption occurs in either of the processes having the shared critical section, the deadlock can be avoided.

10. Suppose process P1 has a period of 60 units and burst time of 30 units. If 86% of the total CPU resources are being utilized to run P1 and another process P2, calculate the period of process P2.(Assume that the burst for P2 is half of P1).

- A. 55.86
- B. 89.94
- C. 41.67
- D. None of the above

Solution : Option C. 41.67

Explanation: Let burst be b. Therefore, $0.86 = 30/60 + b/15$; $b = 41.67$

Short-Answer type(Alphanumeric answers only):

11. Consider the following 4 processes, scheduled by round-robin with a time slice of 3 units.

PID	Arrival Time	Burst Time
A	0	6
B	1	7
C	2	9
D	3	10

Calculate the wait time of process C.

Solution: 17

Explanation:

Turn-Around Time = End time - Arrival time

Wait Time = Turn-Around Time - Burst Time

PID	Arrival Time	Burst Time	Turn Around Time	Wait time
A	0	6	15	9
B	1	7	24	17
C	2	9	26	17
D	3	10	29	19

12. State if the following tasks can be scheduled by the RMS algorithm. Also calculate the minimum CPU utilization(U_p to nearest whole number in percent). (Answer format = <Yes/No>-<Value>)

PID	Period	Execution Time
1	8	2
2	7	1
3	9	2
4	6	1

Solution: No-77

Explanation = utilization = $\sum(c/p)$: c=execution time, p =period

Therefore utilization = $2/8 + 1/7 + 2/9 + 1/6 = 0.77 = 77\%$

Also, for n processes, utilization $\leq n(2^{1/n} - 1)$ for processes to be schedulable.

Putting n=4, utilization $\leq 75.68\%$, therefore processes are not schedulable.