1. Which of the following are embedded system design approaches?
   a) Object oriented approach
   b) Linker time optimization
   c) Both (a) and (b)
   d) None of the above

2. Which of the following statements are correct regarding standard OS and RTOS?
   a) In standard OS, applications can not directly access device drivers
   b) In RTOS, applications can’t directly access device drivers
   c) Both (a) and (b)
   d) None of the above

3. Which of the following statements are correct regarding RTOS?
   A. Devices can be directly connected to the interrupt line of the processor
   B. Protection is optional
   C. Interrupts can be disabled for a long time
   D. Contiguous file allocation is desirable
   a) Only A
   b) A, B and D
   c) Only B
   d) A and C

4. VxWorks is
   a) Fast
   b) Proprietary
   c) RTOS
   d) All of the above

5. Let A be a section of program code, n processes want to access A. No more than m processes should be allowed to access A simultaneously (m > 1, m <= n). If we use semaphores to enforce above conditions, which of the following option is correct?
   a) Use counting semaphore
   b) Use binary semaphore
   c) Both (a) and (b)
   d) None of the above
6. Which of the following statements are correct?

A. Every set of real time problems are schedulable
B. Round robin scheduling is preemptive
C. In a preemptive scheduling algorithm, context switch occurs when current process requires an I/O operation
D. Initial value of counting semaphore determines maximum number of processes that can enter the critical section simultaneously

   a) Both A and B  
   b) B, C and D  
   c) Only B  
   d) All of the above

7. Consider an embedded system running Rate-monotonic scheduling (RMS) with 4 tasks. The system is always schedulable if CPU utilization is less than ________ % (round off answer to 2 decimal places).

   a) 75.68  
   b) 78.5  
   c) 80.5  
   d) 90

   Explanation is shown below.

In RMS, tasks are schedulable if CPU utilization $\leq n \left(2^{1/n} - 1 \right)$

Here $n = 4$

CPU utilization $\leq .7568$

i.e. CPU utilization $\leq 75.68\%$
8. Consider an embedded system running Earliest Deadline First (EDF) with tasks $T_1 (2, 2, 1)$ and $T_2 (6, 6, 4)$, where $T_n (x, y, z)$ represents task $n$ with period $x$, deadline $y$, and execution time $z$. Which of the following statement is true?

a) Task set is schedulable
b) Task set is not schedulable

Explanation is shown below.

In EDF, tasks are schedulable if CPU utilization $\leq 1$

$$
\text{CPU utilization} = \sum_{i=1}^{2} \frac{c_i}{p_i}
$$

$$
= \frac{1}{2} + \frac{4}{6}
$$

$$
= \frac{7}{6}
$$

So given tasks are not schedulable.

9. Which of the following statements are true regarding shared resources in embedded system?

A. If there are only two tasks, blocking time of a task can be more than the length of critical section
B. If there are more than two tasks, blocking time of a task can be more than the length of critical section
C. If there are only two tasks, worst case blocking time of a task is the length of critical section

a) Both A and B
10. Which of the following statements are true?

A. Priority inversion problem can be solved by using priority inheritance
B. Priority inversion problem can be solved by disallowing preemption during the execution of critical section
C. Priority inversion problem can occur even if there is no mutual exclusion

a) Both A and B
b) Only B
c) Only C
d) All of the above