Name:…….

Roll No:……..

SREE BUDDHA COLLEGE OF ENGINEERING, PATTOOR

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

MODEL EXAMINATION

M.TECH- EMBEDDED SYSTEMS

TEC 2002 Real-Time Operating Systems

Time: 3 hrs **Max. Marks: 60**

*Answer any two from each module. Each question carries **ten** marks.*

Module 1

1. a) What are the different states in which a task can reside? Explain with a FSM. (6)

   b) Write a linux program to create a child process which calculates the square root of a number. Make use of pipes to obtain the result in the parent process and display the output. (4)

2. How can you use semaphores to address synchronization design requirements effectively? Use figures and pseudo codes to support your answer. (10)

3. a) What is a microkernel? What are its advantages over monolithic kernel? (3)

   b) Consider an example system with 256 bytes of ROM, 16KB of flash memory and two blocks of RAM. RAMB0 is 128KB of SDRAM and RAMB1 is 2MB of DRAM. An embedded application with the following sections needs to be mapped into this target system.

_loader	:	Contains the loader code.
_wflash	:	Contains the flash memory programmer.
.rodata	:	Contains non-volatile default initialization parameters and data.
.sbss	:	Contains uninitialized data less than 64KB.
.sdata	:	Contains initialized data less than 64KB.
.bss	:	Contains uninitialized data larger than 64KB.
.data	:	Contains initialized data larger than 64KB.
_monitor	:	Contains the monitor code.
.text	:	Contains other program code.

Give the possible allocation for this case. Mention the section allocation strategies used. (7)

Module 2

4. a) Classify synchronization. Implement barrier synchronization mechanism using a mutex and condition variable. Use pseudo codes to explain your answer. (6)

   b) Write a program to depict a client server process as two separate programs communicating through shared memory. The server program should create a shared memory and write a string to the shared memory segment. The client program should attach itself to the shared memory and read from it. (4)

5. What is reader writer problem? Implement reader writer lock using condition variables. Provide the necessary code snippets. (10)
6. a) What is bounded buffer problem? Provide a solution to this using counting semaphore. Write the required pseudo code. (6)

   b) Check whether the following set of three periodic real time tasks on a uniprocessor are schedulable using RMA test? Is RMA optimal when deadlines differ from task periods? (4)

Periodic Task	Start time (ms)	Processing time(ms)	Period(ms)	Deadline(ms)
T1	20	25	150	100
T2	40	7	40	40
T3	25	10	30	20

Module 3

7. a) Write short notes on C functions used in RTX51 tiny and full. (5)
   b) Describe briefly about P and V POSIX semaphores with an example code. (5)
8. Design a chocolate vending machine and write the required code using RTX51 as your design platform. (10)
9. Write a C code for Sobel edge detection making C6701 EVM as the target board. Make use of a DSP/BIOS task such that this task is suspended during the write operation, allowing RTDX operation to succeed. (10)