**Model Question Paper**

**Total Duration (H:M): 3:00**

**Course: Operating System and Embedded Systems(22EECC304** **)**

**Maximum Marks :100**

| **Q.No** | **Questions** | **Marks** | **CO** | **BL** | **PI** |
| --- | --- | --- | --- | --- | --- |
| **UNIT I** | | | | | |
| 1a | Consider the following set of processes, with the length of the CPU-burst-time given in milliseconds  Process Burst Arrival  Time time  P1 7 2  P2 3 0  P3 8 1  P4 4 4  Calculate average wait time and TAT using Round Robin algorithm with quantum time as 3mili sec and context switch time 1msec. | 8M | 2 | 3 | 1.4.5 |
| 1b | What is a System Call? Discuss the system call sequence for printing messages on the terminal. | 6M | 3 | 3 | 2.2.1 |
| 1c | Consider a mobile computing system, the operating system should provide an environment for Online meeting. Discuss various system calls involved in  carrying out user task. | 6M | 1 | 2 | 1.4.3 |
| 2a | Compare the performance with respect to the average waiting time and turnaround time(TAT) by applying SJF (pre-emptive), Priority scheduling (non-pre-emptive)  Process Burst time Arrival time Priority  P1 8 0 4  P2 6 2 1  P3 1 2 2  P4 9 1 2 | 8M | 2 | 3 | 1.4.3 |
| 2b | Discuss the various services an operating system provides from the perspective of program execution. | 6M | 3 | 3 | 1.4.3 |
| 2c | What is the main advantage of the microkernel approach to system  design? How do user programs and system services interact in a microkernel architecture? What are the disadvantages of using the  microkernel approach? | 6M | 1 | 2 | 2.2.1 |
| 3a | Calculate the average wait time & TAT using SJF (pre-emptive & non-pre-emptive), Priority scheduling & RR considering AT for following processes and compare w.r.t performance.   |  |  |  |  | | --- | --- | --- | --- | | **Process** | **AT** | **BT** | **Priority** | | **P1** | **0** | **4** | **0** | | **P2** | **1** | **5** | **1** | | **P3** | **3** | **2** | **2** | | **P4** | **4** | **1** | **3** | | **P5** | **2** | **6** | **4** | | **P6** | **6** | **6** | **5** | | 8M | 3 | 3 | 2.2.1 |
| 3b | What is the use of a process control block? Discuss the changes in the PCB chains when a. A process makes an I/O request b. A process completes an I/O Operation. | 6M | 1 | 2 | 1.4.3 |
| 3c | Consider a 64 MB physical memory machine and a 32-bit virtual address space. If the page size is 4KB, what is the approximate size of the page table? (GATE 2001). Explain the steps with neat diagrams.  If a system has 32 bit virtual addresses and 1 KB page size, what can be the size of page table if (i)one-level page tables are used (ii)Two levels of page tables are used | 6M | 2 | 3 | 1.4.3 |
| **UNIT II** | | | | | |
| 4a | Write an optimized program where task1 reads the key pressed and broadcast the key value and task2 receives it and displays on UART and task3 also receives same key value and displays on seven segment. | 8M | 2 | 3 | 2.2.1 |
| 4b | Develop a code to calculate time taken by software loop using on chip hardware timer and display result using serial port. Comment on the performance. | 6M | 3 | 2 | 1.4.5 |
| 4c | What is message queue? draw its structure, state diagram and how memory is been allocated. | 6M | 1 | 3 | 1.4.5 |
| 5a | Write an optimized code to Create two applications, app1 to convert analog to digital data and store the result in memory pool, app2 to use this information and display on serial port. Demonstrate optimization with code profiling. | 8M | 2 | 3 | 2.2.1 |
| 5b | What are the difference means of achieving multitasking, explain with suitable examples. | 6M | 3 | 3 | 1.4.3 |
| 5c | Write a C program using round robin scheduling algorithm. Task1—Read input from serial port and perform GCD display on UART.  Task2—perform LCM display on UART.  Task3—perform multiplication display on UART. | 6M | 1 | 3 | 2.2.1 |
| 6a | Write a code to Create three applications, they share stepper motor, app1 rotates stepper motor in clockwise for 5 rotations and app2 rotates it in anticlockwise for 5 rotations and app3 stops it for one second | 8M | 3 | 3 | 2.2.1 |
| 6b | How mutex semaphore differs from binary semaphore? Justify with suitable explanation. | 6M | 1 | 2 | 1.4.3 |
| 6c | Implement 3 error conditions using SWI  1. Divide by zero  2. Negative result after subtraction  3. Floating point operation | 6M | 2 | 3 | 2.2.1 |
| **UNIT III** | | | | | |
| 7a | Briefly describe the features of the Cortex M3 based microcontrollers memory organization. What are the major address ranges? | 10 | 3 | 2 | 1.4.3 |
| 7b | Compare the features of SPI and I2C communication, analyze their advantages and disadvantages. Show an example of peripheral communication using these buses. What are the typical peripherals using these buses? | 10 | 3 | 2 | 1.4.3 |
| 8a | What are the main differences between USB versions? Which versions are typically used in a microcontroller environment? Describe the USB’s four types of transfers. | 10 | 4 | 2 | 1.4.3 |
| 8b | Develop a C code to program RTC to generate HOURS, MINUTES And SECONDS using I2C protocol. | 10 | 4 | 3 | 1.4.5 |