Sr. No. of Question Paper : 1562   C   Roll No.............

Unique Paper Code   : 234461

Name of the Course   : B.Sc. (Prog.)

Name of the Paper   : Operating Systems (CSPT–404)

Semester   : IV

Duration   : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Question No. 1 is compulsory.

3. Attempt any **Five** from remaining **seven** questions.

4. In all **six** questions are to be attempted.

5. Marks are indicated against each question.

6. All parts of a question must be done together.

1. (a) Define the essential properties of handheld systems. (2)

     (b) What are system calls ? List any four different types of system calls. (3)

     (c) What are the different states that a process can be in ? (2)

     (d) What is the process control block ? What are its components ? (4)

     (e) Differentiate between trap and interrupt. (2)

     (f) Why is it important for the scheduler to differentiate between I/O bound and CPU bound programs ? (2)

     (g) What do you understand by starvation of processes ? Suggest a solution to handle this problem. (2)

(h) What are cooperating processes ? What are the requirements to solve critical-section problem of cooperating processes.   (4)

(i) Explain the purpose of open () and close () operations of a file.   (2)

(j) List the different layers of file system.   (2)

2. (a) What is the dual mode operation of the operating system ? How does the dual mode feature provide greater protection for the operating system ?   (5)

    (b) List any four services provided by OS. Explain how each provides convenience to the user ?   (4)

    (c) List any two ways to pass parameters to system calls.   (1)

3. (a) What are the main advantages and disadvantages of microkernel approach to OS design ?   (3)

    (b) Describe the actions taken by the kernel to context switch between processes.   (3)

    (c) Differentiate between single threaded and muti-threaded process with the help of diagram. What are the benefits of multithreaded programming ?   (4)

4. Consider the following processes for execution :

Process	Priority	Burst Time
P_1	3	10
P_2	1	1
P_3	3	2
P_4	2	1

The Processes are assumed to have arrived in order P_1, P_2, P_3, P_4 all at time 0.

    (i) Draw the Gantt Charts to illustrate the execution of these processes using FCFS, SJF, non preemptive priority and RR (quantum = 1).

    (ii) Calculate the turnaround time and waiting time for each process for each scheduling algorithm in part (i).

    (iii) Which algorithm proves to be more efficient ? Justify your answer.

                                                               (10)

5.   (a) Consider a paging system with the page table stored in memory.

       (i) If a memory reference takes 200 nanoseconds, how long does a paged memory reference take ?

       (ii) If we add TLBs, and 75% of all page-table references are found in the TLB's, what is the effective memory access time ? (Assume that finding a page-table entry in the TLB takes 20 nanoseconds.)   (4)

   (b) Assuming a 1-KB page size, what are the *page numbers* and *offsets* for the following address references ?

       (i) 2375

       (ii) 19366   (2)

   (c) Given five memory partitions of 100 KB, 500 KB, 200 KB, 300 KB, and 600 KB (in order), how would each of the first-fit, best-fit, and worst-fit algorithms place processes of 212 KB, 417 KB, 112 KB, and 426 KB (in order) ? Which algorithm makes the most efficient use of memory ?   (4)

6.   (a) What is virtual memory ? What are the benefits of virtual memory systems ?   (3)

   (b) What is a page fault ? What steps are taken by the OS to handle page faults ?   (4)

(c) How many page faults occur for FCFS algorithm for the following reference string, for three page frames ?

$$1, 2, 3, 4, 5, 3, 4, 1, 6, 7, 8, 7, 8, 9, 7 \qquad (3)$$

7. (a) Explain indexed allocation method for allocating blocks to a file. What are mechanisms used for deciding the size of index block ? (8)

(b) How does ACL help in providing file protection ? (2)

8. Write short notes on any **two** of the following :

(i) Tree structured directories

(ii) Acyclic graph directory structure

(iii) File allocation table (FAT)

(iv) Segmentation memory management scheme

(v) Contiguous Memory Allocation schemes (10)