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Fifth Semester B.E. Degree Examination, May/June 2010
Operating Systems

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting at least TWO questions from each part.

PART – A

- 1 a. Explain the following terms :
 - i) Bootstrap program ii) Caching iii) Trap
 - iv) Job pool v) Symmetric multiprocessing. (10 Marks)
- b. Explain two sets of operating system services that are helpful to user as well as efficient operation of system. (05 Marks)
- c. Write and explain the sequence of system calls for copying a file to another (new) file. (05 Marks)
- 2 a. What is PCB? Enumerate and explain various fields in PCB. (04 Marks)
- b. What is multithreading? Explain the benefits of multithreaded programming. (05 Marks)
- c. Consider the following set of processes :

Process	Arrival time	Burst time
P ₁	0	1
P ₂	1	9
P ₃	2	1
P ₄	3	9

- i) Draw Gantt charts showing the execution of these processes using FCFS, preemptive SJF, non-preemptive SJF and RR (Quantum – 1) scheduling schemes.
- ii) Compute the turn around time and waiting time for each process for each of the schemes above.
- iii) Compute the average turn around time and average waiting time in each scheme and thus find the best scheme in this particular case. (11 Marks)
- 3 a. Define race condition. List the requirements that a solution to critical section problem must satisfy. (05 Marks)
- b. What are semaphores? Explain two primitive semaphore operations. What are the advantages of semaphore? (07 Marks)
- c. Define the algorithms TestAndSet() and swap(). Show that they satisfy mutual exclusion. (08 Marks)
- 4 a. Explain how resource-allocation graph is used to describe deadlocks. (05 Marks)
- b. What are the different methods for handling deadlocks? Explain Banker's algorithm. (11 Marks)
- c. "A safe state is not a deadlock state but a deadlock state is an unsafe state". Explain. (04 Marks)

PART – B

- 5 a. What do you mean by dynamic storage allocation problem? Explain possible solutions to this problem. (04 Marks)
- b. Explain the concept of forward-mapped page table. (04 Marks)
- c. Consider the following reference string : 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1. Assuming three frames, all initially empty, how many page faults would occur for :
 - i) LRU ii) FIFO iii) Optimal page replacement algorithms? Which of the algorithms is most efficient in this case? (12 Marks)

- 6 a. What is meant by 'consistency semantics'? Explain the consistency semantics as implemented in a modern O. S. (07 Marks)
- b. With the help of a neat diagram, describe :
- i) Tree –structured directory
 - ii) Acyclic – graph directory. (08 Marks)
- c. Explain virtual file system(VFS). (05 Marks)
- 7 a. Suppose the position of cylinder is at 53. Sketch the graphical representation for the queue of pending requests in the order – 98, 183, 37, 122, 14, 124, 65, 67 for FCFS, SSTF and LOOK scheduling schemes. Give your comment on this scenario for the above schemes. (12 Marks)
- b. Describe the access matrix model used for protection in a computer system. (08 Marks)
- 8 Write short notes on :
- a. Components of Linux system
 - b. Processes and threads
 - c. Conflict resolution mechanism of Linux
 - d. Linux file system. (20 Marks)

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Fifth Semester B.E. Degree Examination, December 2010
Operating Systems

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting at least TWO questions from each part.

PART - A

1.
 - a. Define an operating system. Explain two view points of OS role. (05 Marks)
 - b. What are OS operations? Explain. (06 Marks)
 - c. Define a virtual machine (VM). With a neat diagram, explain the working of a VM. What are the benefits of a VM? (09 Marks)
2.
 - a. Define IPC (Inter process communication). What are the different methods used for logical implementation of a message passing system? Explain any one. (06 Marks)
 - b. Discuss three common ways of establishing relationship between the user thread and kernel thread. (06 Marks)
 - c. Consider the following set of processes, with the length of CPU burst in milliseconds.

Process	P ₁	P ₂	P ₃	P ₄	P ₅
Arrival time	00	02	03	06	30
Burst time	10	12	14	16	05

- i) Draw a Gantt chart that illustrates the execution of these processes using the preemptive shortest job first (SJF) algorithm. Hence find the average waiting time.
 - ii) Draw a Gantt chart that illustrate the execution of these processes using preemptive priority scheduling algorithm. Given priority of each process is P₁ = 4, P₂ = 3, P₃ = 5, P₄ = 1 and P₅ = 1. Also find the average waiting time. (08 Marks)
3.
 - a. What do you mean by a binary semaphore and a counting semaphore? Along with the necessary 'C'-struct, explain the implementation of wait() and signal() semaphore operations. (10 Marks)
 - b. With the necessary syntax, describe the term monitor. Explain the solution to the classical dining philosopher's problem, using monitor. (10 Marks)
4.
 - a. Define the terms: safe state and safe sequence. Give an algorithm to find whether or not a system is in a safe state. (10 Marks)
 - b. Consider the following snapshot of the system.

	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P ₀	0	0	1	2	0	0	1	2	1	5	2	0
P ₁	1	0	0	0	1	7	5	0				
P ₂	1	3	5	4	2	3	5	6				
P ₃	0	6	3	2	0	6	5	2				
P ₄	0	0	1	4	0	6	5	6				

Using the Bankers algorithm, answer the following:

- i) What is the content of a matrix NEED?
- ii) Is the system in SAFE state? If yes, give the SAFE state.
- iii) If a request from a process P₁ arrives for (0,4,2,0), can the request be granted immediately? (10 Marks)

PART - B

- 5 a. What do you mean by a address binding? Explain with the necessary steps, the binding of instructions and data to memory addresses. (08 Marks)
- b. On a system using demand paged memory it takes $0.12 \mu\text{s}$ to satisfy a memory request, if the page is in memory. If the page is not in memory the request takes $5000 \mu\text{s}$. What would the page fault rate need to be to achieve an effective access time $1000 \mu\text{s}$? Assume the system is only running a single process and the CPU is idle during the page swaps. (08 Marks)
- c. What do you mean by a copy-on-write? Where is it used? Explain in brief. (04 Marks)
- 6 a. What do you mean by a free space list? With suitable examples, explain any two methods of implementation of a free space list. (08 Marks)
- b. What are the major methods used for allocating a disk space? Explain each, with suitable examples. (12 Marks)
- 7 a. Discuss the steps in handling a page fault, with the help of a neat diagram. (10 Marks)
- b. Given the page reference string:
0 9 0 1 8 1 8 7 8 7 1 2 8 2 7 8 2 3 8 3
Three frames allocated for the program in the main memory. Determine the number of page faults using i) LRU policy ii) Optimal replacement policy. (10 Marks)
- 8 a. Discuss the directory implementation using
i) Linear list ii) Hash table (10 Marks)
- b. What are the components that the kernel module support under Linux? Explain in detail. (10 Marks)
