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Question Paper Code : 70399

M.E./M.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

First Semester

Computer Science and Engineering

CP 5153 – OPERATING SYSTEM INTERNALS

(Common to M.E. Computer Science and Engineering (with Specialization in Networks)/M.E. Multimedia Technology/M.Tech. Information Technology)

(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. Enumerate the difference between multiprocessing, multiprogramming, multitasking and multithreading.

2. Explain the main purpose of an operating system.

3. Consider a paging hardware with a TLB. Assume that the entire page table and all the pages are in the physical memory. It takes 10 milliseconds to search the TLB and 80 milliseconds to access the physical memory. If the TLB hit ratio is 0.6, what is the effective memory access time (in milliseconds).

4. Draw the resource allocation graph for the following situation and determine if the system is in deadlock :

   Given the sets P, R and E as

   P = {P1, P2, P3}

   R = {R1, R2, R3, R4}

   E = {P1 → R1, P2 → R3, R1 → P2, R2 → P2, R2 → P1, R3 → P3}

5. Differentiate internal commands from external commands.

6. What is the basic function of paging ?

7. How does dynamic loading aid in better memory space utilization ?

8. State the main difference between logical from physical address space.

9. State the role of pipe in communication between processes.

10. Explain pros and cons of a command line interface ?

PART – B **(5×13=65 Marks)**

11. a) Define the essential properties of the following types of operating systems :

i) Real time

ii) Network

iii) Distributed

iv) Clustered

v) Batch processing.

(OR)

b) Consider the following set of processes that need to be scheduled on a single CPU. All the times are given in milliseconds.

Process Name	Arrival Time	Execution Time
A	0	5
B	2	2
C	4	3
D	6	5
E	9	4

Draw the gantt chart for the shortest remaining time first scheduling algorithm, Round Robin scheduling algorithm with time quantum as 2 ms. Find out the average process turnaround time and average waiting time (in msec).

12. a) What are the assumption Peterson solution assume to prove deadlock free and starvation free ? How Peterson solution for mutual exclusion of two processes on single processor, can be extended to work for two processes on two processors.

(OR)

b) Consider the system having 5 process (P1, P2, P3, P4, P5) and 3 resources (R1, R2, R3). Resource R1 has 10 instances, Resource R2 has 5 instances and Resource R3 has 7 instances. Analyze the following questions using Banker's Algorithm.

Process	Allocation R1 R2 R3	Maximum R1 R2 R3
P1	0 1 0	7 5 3
P2	2 0 0	3 2 2
P3	3 0 2	9 0 2
P4	2 1 1	2 2 2
P5	0 0 2	4 3 3

What is the content of Need Matrix and find out the safe sequence ?

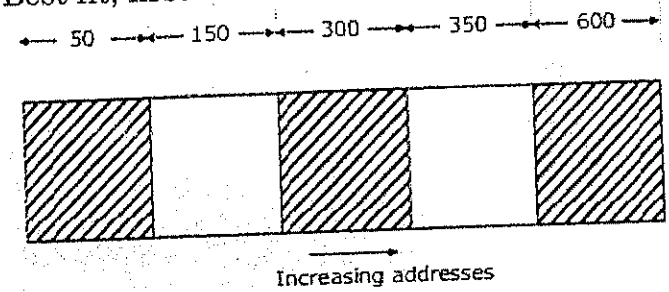
13. a) A process has been allocated 3 page frames. Assume that none of the pages of the process are available in the memory initially. The process makes the following sequence of page references (reference string) : 2, 3, 2, 4, 8, 5, 6, 7, 4, 2.

i) If optimal page replacement policy is used, how many page faults occur for the above reference string ? **(5)**

ii) Least Recently Used (LRU) page replacement policy is a practical approximation to optimal page replacement. For the above reference string, how many more page faults occur with LRU than with the optimal page replacement policy ? **(8)**

(OR)

b) Consider the following heap (figure) in which blank regions are not in use and color regions are in use. The sequence of requests for blocks of size 300, 25, 125, 50 can be satisfied. Which of the allocation policy will satisfy the need ? Best fit, first fit and worst fit. Justify your answer with suitable explanation ?



14. a) Consider a disk system with 100 cylinders. The requests to access the cylinders occur in following sequence : 4, 34, 10, 7, 19, 73, 2, 15, 6, 20. Assuming that the head is currently at cylinder 50, what is the time taken to satisfy all requests if it takes 1ms to move from one cylinder to adjacent one

i) Shortest seek time first policy is used.

ii) First Come First Serve is used.

(OR)

b) Compare the performance of CSCAN and SCAN scheduling assuming a uniform distribution of requests. Consider the average response time (the time between the arrival of a request and the completion of that request's service), the variation in response time and the effective bandwidth. How does performance depends on the relative sizes of seek time and rotational latency.

15. a) In Linux OS, file system uses inode data structure to store the attribute of file.
   i) What is difference between inode table and File Allocation Table ? **(3)**
   ii) Where inode of a file get stored in the disk ? Where the inode table get stored in the disk ? Where the FAT get stored in the disk ? **(2+2+2)**
   iii) How can you design a fault tolerant inode table and FAT of a file system ? Give an example of such file system. **(4)**

(OR)

b) Describe what happens when a system call is made, including how the kernel code for the specific system call is invoked with the correct parameters passed and any other relevant details.

PART – C **(1×15=15 Marks)**

16. a) An application program is being developed for a microprocessor based controller for an automobile. The application is required to perform the following functions :
   a) Monitor and display the speed of the automobile.
   b) Monitor the fuel level and raise an alarm, if necessary.
   c) Display the fuel efficiency.
   d) Monitor the engine condition and raise an alarm if an unusual condition arises.
   e) Periodically record some auxiliary information like speed, fuel level etc.

   Answer the following questions concerning the application :
   i) Is this a real time application ? Justify.
   ii) It is proposed to create multiple processes to reduce the response time of the application. What are the processes and their priorities ?
   iii) Is there a necessity to define any application specific interrupts ? Justify.

(OR)

b) Consider an OS that has 128 different priority levels for processes from 1 to 128, with lower level indicating higher priority. A process with some priority can be scheduled only if there is no higher priority process present in the ready queue. Scheduling between processes at the same level is FCFS. The priorities are set statically during creation of the process and not changed after that. How will you organize the ready queue to efficiently choose the next process to schedule ? Justify your design briefly.