Sardar Patel Institute of Technology

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(Autonomous College Affiliated to University of Mumbai)

End Semester Examination Synoptic

April/May 2018

Max. Marks: 100 | **Duration: 3 Hours**
Class: SE | **Semester: IV**
Course Code: CE43/IT44 | **Branch: Computer/IT**
Name of the Course: (Synoptic) Operating System

Question No.		Max. Marks
Q.1 (a)	Explain fork and exec system calls with example program along with the expected output of the program. fork system call explanation- 1 mark 1 marks for sample program 1 marks for the explanation of correct output exec system call explanation - 1 mark 1 marks for sample program 1 marks for the explanation of correct output	06
Q.1 (b)	Differentiate between monolithic and microkernel architectures (2 distinct points only) along with neat diagram. any two differences- 1 mark each so total 2 marks 1 mark for diagram of each of the architecture- 2 marks separation of user space and kernel space components should be shown clearly- otherwise no marks will be awarded	04
Q.2 (a)	For the process parameters in the table below, find average waiting time and average turnaround time for FCFS and preemptive SJF scheduling algorithm. Ties in preemptive SJF is broken by the Process ids, process containing lower id is executed first.	10

Process	Arrival Time	Burst Time
P1	0	6
P2	1	4
P3	3	5

Correct Gantt chart of both algorithms:-1 mark each , so total 2 marks
Turnaround time and waiting time for each process ½ mark and average waiting time and average ta time ½ mark so for each algorithm there will be 4 marks. Total 2 algorithms so 8 marks.
FCFS Gantt chart:-

P1	P2	P3
6	10	15

Waiting time for P1 = 0
Waiting time for P2 =5
Waiting time for P3 =7
Average waiting time = 12/3=4

Tat for P1= 6

Waiting time for P2 =0
Waiting time for P3 =0
Waiting time for P4 =16
Waiting time for P5 =9

Average waiting time = 27/5=5.4 ms
Non- Preemptive Priority will have maximum throughput

Q.2 (b) Explain multithreading models with respect to user and kernel level threads. — 04

there are three models- many to one, one to one and many to many, listing -1 mark
1 mark each for the explanation of models - 3 marks

Q.2 (c) Compare long term scheduler, short term scheduler and medium term scheduler with respect to the following points: — 06

A. Selection of processes
B. Frequency of execution
1 mark for each point, there are two points given- 2 marks *3 =6 marks

Q.3 (a) Consider the following state of a system and answer the following questions: — 10

Resource type	Total instances
A	13
B	9
C	8

Processes	Allocation			Max		
	A	B	C	A	B	C
P0	3	0	1	10	7	4
P1	1	2	0	8	5	3
P2	2	1	3	6	3	4
P3	0	3	0	9	6	3
P4	1	1	2	7	4	5

A. Find Available vector.
B. Find need matrix.
C. State whether the system is in safe state or not. If yes, find any one possible safe sequence.
Initial available vector – 2 marks
Need matrix- 2 marks
Work vector shown at each step – 5 marks
Writing correct safe sequence :- 1 marks (There are more than one safe sequences so any one can be accepted)

Available vector:-

A	B	C
6	2	2

Need matrix

Process	A	B	C
P0	7	7	3
P1	7	3	3
P2	4	2	1
P3	9	3	3
P4	6	3	3

Safe Sequence can be P2,P1,P3,P4,P0 or P2,P4,P1,P3,P0

Q.3 (b)	Describe deadlock detection algorithm for multiple instances of a Resource type.[Example not required.] description of data structures used in the algorithm- 2 marks correct algorithm description - 3 marks if algorithm's logic is correct then only full marks will be given otherwise 0.5 marks will be deducted for each mistake. OR Explain compare and swap construct to solve critical section problem with example (pseudo code). Explanation- 2 marks Correct Pseudo code with no logical errors- 3 marks	05
Q.3 (c)	State readers' writers' problem. Solve by writing pseudo code and explain the readers' writers' problem solution using Semaphores. problem definition- 2 marks 4 marks for reader's process 4 marks for writer's process Description of each process should include the semaphores used and the purpose of each of the semaphores.it should also include the description of each of the processes logic. OR State producer consumer problem. Solve by writing pseudo code and explain the producer consumer problem solution using Semaphores. Use 3 semaphores viz. empty counting semaphore initialized to 5, full counting semaphore initialized to 0 and mutex semaphore initialized to 1. problem definition- 2 marks 4 marks for producer's process 4 marks for consumer's process Description of each process should include the semaphores used and the purpose of each of the semaphores.it should also include the description of each of the processes logic.	10
Q.4 (a)	On a simple paged system, associative registers hold the most active page entries and the full page table is stored in the main memory. If references satisfied by associative registers take 100 ns, and references through the main memory page table take 180 ns, what must be the hit ratio to achieve an effective access time of 125 ns? 2 marks for formula- EAT=(1-p)*ma+p* page fault service time 125=(1-p)*180+p*100 – 2 marks for substituting correct values at correct places 1 mark for answer :- p=0.6875 OR On a simple paging system with 2^{24} bytes of physical memory, 256 pages of logical address space, and a page size of 2^{10} bytes, answer the following: A. How many entries are needed to store an entry in the page table (how wide is the each page table entry)? Assume each page table entry contains a valid/invalid bit in addition to the page frame number (valid or invalid bit plus the page frame number). B. How many bits are there in a logical address? **A.** 2.5 marks for correct answer $2^{24}/2^{10}=2^{14}$ frames=>14 bits are there for frame number and 1 bit for valid/invalid bit. **B.** 2.5 marks for correct answer 10 (offset) +8(page number) =18	05
Q.4 (b)	Consider the following reference string: a, b, c, d, c, a, d, b, e, b, a, b, c, d and the size of the frame be 4. Calculate total number of page faults and hit ratio using optimal page replacement policy. 3 marks for demonstrating optimal policy 1 mark for total page faults 1 mark for hit ratio	05

	Time Req / Page frames	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		a	b	c	d	c	a	d	b	e	b	a	b	c	d
	0 a	a	a	a	a	a	a	a	a	a	e	e	e	e	d
	1 b		b	b	b	b	b	b	b	b	b	a	a	a	a
	2 c			c	c	c	c	c	c	c	c	c	b	b	b
	3 d				d	d	d	d	d	e	d	d	d	c	c
	FAULTS	x	x	x	x					x					x

Q.4 (c)	What is demand paging? What are the six steps in handling a page fault. Explain with diagram. Demand paging explanation- 2 marks Six steps- 6 marks Diagram showing correct execution of six steps- 2 marks	10
Q.5 (a)	On a disk with 1000 cylinders, numbered 0 to 999, compute the number of tracks the disk arm must move to satisfy all the requests in the disk queue. Assume the last serviced was at track 345 and the head is moving towards track 0. The queue in FIFO order contains requests for the following tracks: 123, 874, 692, 475, 105, 376. Perform the computation for the following scheduling algorithms: A. SCAN B. SSTF 1 Mark for diagram, ½ for each request calculation so for 6 request 3 marks, total head movement: 1mark. So for each algorithm – 5 marks total. So 5*2=10 A. SCAN – 345 ->123 = 222 123 -> 105 = 18 105 -> 0 =105 0 -> 376 =376 376 -> 475 = 99 475 -> 692 = 217 692 ->874 =182 So, total head movement is 1219 tracks B. SSTF 345 -> 376 = 31 376 -> 475 =99 475 -> 692 = 217 692 -> 874 = 182 874 -> 123 = 751 123 -> 105 = 18 So, total head movement is 1298 tracks	10
Q.5 (b)	Compare all file allocation methods with respect to the following points: 1. External fragmentation 2. Access time 3. Suitable for which file access methods Listing of file allocation methods: 1 mark Each valid differentiating point carries 1 mark, so 3 differences each implies 3*3 = 9 marks OR Explain seven features of NTFS. Draw NTFS volume layout and explain the files in the region of system files of NTFS layout. 7 marks for 7 features of NTFS 1 mark for diagram of NTFS layout	10

	2 marks for files in system files region	
Q.5 (c)	Draw the diagram of Linux Virtual File System(VFS) concept. List the primary object types in VFS. Explain any one of them. Diagram- 1 marks Listing of primary object types- 1 marks Explanation of any one object – 3 marks	05