KIIT Deemed to be University
Online End Semester Examination(Spring Semester-2021)

Subject Name & Code: Introduction to Operating Systems Regular/ (CS-3048)Back

Applicable to Courses:B.TECH

Full Marks=50 **Time:2 Hours**

SECTION-A(Answer All Questions. Each question carries 2 Marks)

Time:30 Minutes **(7×2=14 Marks)**

Question No	Question Type (MCQ/SAT)	Question	CO Mapping	Answer Key (For MCQ Questions only)
Q.No:1		The objective of multi-programming is to : a) Have some process running at all times b) Have multiple programs waiting in a queue ready to run c) To minimize CPU utilization d) None of the mentioned	1	a
		'Aging' is : a.keeping track of cache contents b.keeping track of what pages are currently residing in memory c.keeping track of how many times a given page is referenced d.increasing the priority of jobs to ensure termination in a finite time	1	d
		The module that gives control of the CPU to the process selected by the short-term scheduler is? a.Scheduler b.Dispatcher c.Kernel	1	b

		d. None of the above		
		What is a medium-term scheduler ? a) It selects which process has to be brought into the ready queue b) It selects which process has to be executed next and allocates CPU c) It selects which process to remove from memory by swapping d) None of the mentioned	1	c
Q.No:2		Consider the following set of processes, the length of the CPU burst time given in milliseconds : Process Burst time P1 9 P2 8 P3 7 P4 5 Assuming the above process being scheduled with the SJF scheduling algorithm : a.The waiting time for process P1 is 5ms. b.The waiting time for process P1 is 0ms. c.The waiting time for process P1 is 16ms. d.The waiting time for process P1 is 9ms.	2	a
		Consider the following set of processes, the length of the CPU burst time given in milliseconds : Process Burst time P1 6 P2 8 P3 7 P4 3 Assuming the above process being scheduled with the SJF scheduling algorithm : a.The waiting time for process P1 is 6ms. b.The waiting time for	2	d

		process P1 is 0ms. c.The waiting time for process P1 is 16ms. d.The waiting time for process P1 is 3ms.		
		Consider the following set of processes, the length of the CPU burst time given in milliseconds : Process Burst time P1 6 P2 4 P3 9 P4 5 Assuming the above process being scheduled with the SJF scheduling algorithm : a.The waiting time for process P1 is 5ms. b.The waiting time for process P1 is 0ms. c.The waiting time for process P1 is 4ms. d.The waiting time for process P1 is 9ms.	2	c
		Consider the following set of processes, the length of the CPU burst time given in milliseconds : Process Burst time P1 10 P2 8 P3 12 P4 9 Assuming the above process being scheduled with the SJF scheduling algorithm : a.The waiting time for process P1 is 8ms. b.The waiting time for process P1 is 0ms. c.The waiting time for process P1 is 9ms. d.The waiting time for process P1 is 17ms.	2	a
Q.No:3		Suppose the time to service a page fault is on the average 10 milliseconds,	3	d

		while a memory access takes 1 microsecond. Then a 99.99% hit ratio results in average memory access time of (a) 1.9999 milliseconds (b) 1 millisecond (c) 9.999 microseconds (d) 1.9999 microseconds		
		Which of the following need not necessarily be saved on a context switch between processes? (a) General purpose registers (b) Translation look-aside buffer (c) Program counter (d) All of the above	3	b
		If the quantum time of round robin algorithm is very large, then it is equivalent to: (A) First in first out (B) Shortest Job Next (C) Lottery scheduling (D) None of the above	3	a
		Increasing the RAM of a computer typically improves performance because: (A) Virtual memory increases (B) Larger RAMs are faster (C) Fewer page faults occur (D) Fewer segmentation faults occur	3	c
Q.No:4		Consider a virtual memory system with FIFO page replacement policy. For an arbitrary page access pattern, increasing the number of page frames in main memory will a) Always decrease the number of page faults b) Always increase the number of page faults c) Some times increase the number of page faults d) Never affect the number of page faults	4	c
		Consider a machine with 64	3	c

		MB physical memory and a 32-bit virtual address space. If the page size is 4KB, what is the approximate size of the page table? (a) 16 MB (b) 8 MB (c) 2 MB (d) 24 MB		
		The relocation register helps in _____ a) providing more address space to processes b) a different address space to processes c) to protect the address spaces of processes d) none of the mentioned	4	c
		Codes of transient operating system are code that _____ a) is not easily accessible b) comes and goes as needed c) stays in the memory always d) never enters the memory space	4	b
Q.No:5		Which of the following page replacement algorithms suffers from Belady's anomaly? a) LRU b) OPTIMAL c) FIFO d) BOTH LRU and FIFO	4	c
		A CPU generates 32-bit virtual addresses. The page size is 4 KB. The processor has a translation look-aside buffer (TLB) which can hold a total of 128 page table entries and is 4-way set associative. The minimum size of the TLB tag is: a. 11bits b. 15 bits c. 13 bits d. 18 bits	4	b

		Thrashing occurs when a) When a page fault occurs b) Processes on system frequently access pages not memory c) Processes on system are in running state d) Processes on system are in waiting state	4	b
		Consider the virtual page reference string 1, 2, 3, 2, 4, 1, 3, 2, 4, 1 On a demand paged virtual memory system running on a computer system that main memory size of 3 pages frames which are initially empty. Let LRU, FIFO and OPTIMAL denote the number of page faults under the corresponding page replacements policy. Then a)OPTIMAL < LRU < FIFO b)OPTIMAL < FIFO < LRU c)OPTIMAL = LRU d)OPTIMAL = FIFO	4	a
Q.No:6		What is the mounting of file system? a) crating of a filesystem b) deleting a filesystem c) attaching portion of the file system into a directory structure d) removing the portion of the file system into a directory structure	4	c
		Which one of the following explains the sequential file access method? a) random access according to the given byte number b) read bytes one at a time, in order c) read/write sequentially by record d) read/write randomly by record	5	b
		The larger the block size, the _____ the internal fragmentation.	5	a

		a) greater b) lesser c) same d) none of the mentioned		
		For a direct access file _____ a) there are restrictions on the order of reading and writing b) there are no restrictions on the order of reading and writing c) access is restricted permission wise d) access is not restricted permission wise	5	b
Q.No:7		Consider a disk queue with requests for I/O to blocks on cylinders. 98 183 37 122 14 124 65 67 Considering SSTF (shortest seek time first) scheduling, the total number of head movements is, if the disk head is initially at 53 is? a) 224 b) 236 c) 245 d) 240	5	b
		Consider a disk queue with requests for I/O to blocks on cylinders. 98 183 37 122 14 124 65 67 Considering FCFS (first cum first served) scheduling, the total number of head movements is, if the disk head is initially at 53 is? a) 600 b) 620 c) 630 d) 640	5	d
		In the _____ algorithm, the disk arm starts at one end of the disk and moves toward the other end, servicing requests till the other end of the disk. At the other end, the direction is reversed and servicing continues. a) LOOK	5	b

		b) SCAN c) C-SCAN d) C-LOOK		
		In the _____ algorithm, the disk head moves from one end to the other, servicing requests along the way. When the head reaches the other end, it immediately returns to the beginning of the disk without servicing any requests on the return trip. a) LOOK b) SCAN c) C-SCAN d) C-LOOK	5	c

SECTION-B(Answer Any Three Questions. Each Question carries 12 Marks)

Time: 1 Hour and 30 Minutes **(3×12=36 Marks)**

Question No	Question	CO Mapping (Each question should be from the same CO(s))
Q.No:8	a. Define Operating system with suitable example. Write down the evolution of Operating System? b. Define System Call? Discuss different categories of System Calls with clear example?	1
	a. Design and explain the structure of Operating System and its services over its operations. b. Define cooperating process? Explain how different processes communicate with each other by Inter Process Communication (IPC). Illustrate the design issues related to IPC.	
	a. Explain process states with state transition diagram. Also explain TCB/PCB with a neat diagram.	

	b. Discuss process scheduling and also discuss different types of scheduler available inside the OS.	
Q.No:9	a. Define process Scheduling? Explain different scheduling criteria available to measure the performance scheduling algorithms. Consider a list with the following process, with their arrival time and CPU burst time given in milliseconds. **Process** | **Burst Time** | **Priority** | **Time of Arrival** P1 | 10 | 5 | 0 P2 | 6 | 4 | 1 P3 | 2 | 2 | 3 P4 | 4 | 0 | 5 Compute the average waiting time and turnaround time of each of the process using Priority Scheduling by drawing a suitable 'Gantt chart'. B. Consider the following snapshot of a system: **Process** | **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 | Answer the following questions using the banker's algorithm: (i) Determine the content of need matrix? (ii) Is the system in safe state? If yes find determine the safe sequence. (iii) If a request from process P1 arrives for (0, 4, 2, 0) can the request be granted immediately?	2
	A. Given the following processes with arrival time and CPU burst time in milliseconds: **Process** | **Arrival Time** | **Burst Time** P_1 | 0 | 9 P_2 | 1 | 5	

P_3	2	8
P_4	3	10

Draw the *Gantt chart* for Round-Robin Scheduling where the time quantum=4ms. Calculate the *average waiting time* and *average turnaround time.*

B. Consider a system with five processes and three resources. Resource type A has 10 instances, B has 5 instances and C has 7 instances. The snapshot of the system at a particular point of time is given below:

Processes	**Allocation**			**Max Need**		
	A	**B**	**C**	**A**	**B**	**C**
P_0	0	1	0	7	5	3
P_1	2	0	0	3	2	2
P_2	3	0	2	9	0	2
P_3	2	1	1	2	2	2
P_4	0	0	2	4	3	3

Check whether the system is safe state or not. If safe then what will be the safe sequence for the above system.

A. What is the difference between preemptive and non-preemptive scheduling algorithm? Consider a list of following process, with their arrival time and CPU burst time given in milliseconds.

Process	Burst Time	Priority	Time of Arrival
P1	10	2	0
P2	7	1	2
P3	3	1	2
P4	8	3	3
P5	4	2	3

Find out the average waiting time and turnaround time of each of the process using SRTF and Priority Scheduling by drawing a suitable 'Gnatt chart'. Consider the OS allows preemption here for scheduling.

B. Consider the snapshot of a system as given

below and following are the instances of resource type A,B,C is available.

A = 11 instances, B = 6 instances, C = 8 instances.

Process	Allocation	Max
P_0	1 2 1	8 64
P_1	3 1 1	4 3 3
P_2	4 1 3	8 2 4
P_3	3 2 2	4 3 4
P_4	1 1 4	5 4 4

(ii) Find out the available and need matrix.

(ii Is the system in safe state? If yes find out the safe sequence.

Q.No:10

A. Define Paging? Explain the required hardware support for paging with clear diagram. Consider a system with 32-bit logical address space with page size of 4K bytes, find out the number of entries in the page table.

B. Consider the following sequence of memory references

0, 1, 4, 0, 3, 4, 0, 0, 1, 1, 3, 4, 3

Compute the page fault rate for this reference string having 3 frames using FIFO and LRU replacement algorithm.

3,4

A. Explain Segmentation with suitable example. How Segmentation Hardware supports Segmentation discuss with suitable diagrammatic representation.

B. Consider the following page reference string 1,2,3,4,5,6,1,2,3,4,5,6 and a memory consisting of 3 frames. How many page Faults would occur for LRU and FIFO page replacement algorithms? Comment on the result obtained.

A. Given memory partition of 500K, 600K, 400K, 300K are sequentially placed. How would each of First-Fit, best-Fit, Worst-Fit algorithms place request of 311K, 516K, 213K, 425K, 188K and 445

	arrived in the given order. Which algorithm uses the most efficient use of memory? B. Consider the following page reference string: 0,1,2,3,0,1,2,3,0,1,2,3,4,5,6,7,3,4,5,4,6,7,5,4,5,6 How many page faults would occur for the following page replacement algorithms assuming 4 frames and all the frames are initially empty? (i) LRU Replacement (ii) optimal	
Q.No:11	A. Discuss different file allocation methods in details. Explain how linked allocation solves problems of contiguous allocation while allocating space to file in disk space. B. Suppose a disk drive has 200 cylinders numbered from 0 to 199. The current head position of the disk is at 53. The queue of pending requests in FIFO order is 98, 183, 37, 122, 14, 124, 65, and 67. Compute the average cylinder movements using SSTF and SCAN disk scheduling algorithm.	5
	A. Explain File with different types of file allocation methods in suitable diagrams. B. Let a disk drive have 200 cylinders from 0 to 199. Currently drive is at 100^{th} cylinder and the previous request was at cylinder 88. The queue in FIFO order contains pending request for the following tracks: 55, 58, 39, 18, 90, 160, 150, 38, and 184. What is the total distance the disk arm moves to satisfy all the pending requests for each of the following disk scheduling algorithms from current position? i) SCAN ii) C-SCAN	
	C. Discuss different file allocation methods with their performance analysis in details. D. E. Suppose a disk drive has 300 cylinders numbered from 0 t0 299. The current head position of the disk is at 75. The queue of pending requests in FIFO order is 48, 95, 22,	

	160, 124,256, 210, 172, 119,115, 190,245. Calculate the average cylinder movements by following SSTF and SCAN algorithmd .	