(Please write your Exam Roll No.) Exam Roll No. 00511503116

END TERM EXAMINATION

SIXTH SEMESTER [B.TECH] APRIL - MAY 2019

Paper Code: ETCS-304 **Subject: Operating Systems**

(Batch 2013 Onwards)

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt five questions in all including Q no.1 which is compulsory. Select one question from each unit.

Q1 Answer the following short questions:- **(2.5x10=25)**

(a) What does the CPU do when there are no programs to run?

(b) Can a system detect that some of its processes are starving? If you answer "yes" explain how it can. If you answer "no", explain how the system deals with starvation problem?

(c) In paging, why is it necessary to add the page offset to the starting address of the page frame to generate a physical address?

(d) What is hard page fault and soft page fault?

(e) Where are the following tasks implemented, in the logical I/O layer, the device driver, or both?
(i) Checking access permissions
(ii) Scheduling the I/O operations
(iii) Checking if the requested information is in the cache

(f) Is it possible to simulate in software a multilevel directory structure on a system that only supports a single-level tree? Justify your answer.

(g) How do placing index blocks near the data they reference, improve access time?

(h) If the average page fault service time of 25 ms and a memory access time of 100ns. Calculate the effective access time.

(i) What are the four necessary conditions for deadlock to occure?

(j) What are the causes of Thrashing?

UNIT-I

Q2 (a) Compare and Contrast Network, Parallel and distributed operating systems. **(5)**

(b) In a system using paging and segmentation, the virtual address space consists of up to 8 segments where each segment can be upto 2^{29} bytes long. The hardware pages each segment into 256 byte pages. How many bits in the virtual address specify the following:- **(4)**
(i) Segment number
(ii) Page number
(iii) Offset within page
(iv) Entire virtual address

(c) Explain the difference between a monolithic operating system and one based on micro-kernel architecture. **(3.5)**

Q3 (a) Describe the function of operating system software in the following memory management scheme: **(5)**
(i) Multiple variable partition
(ii) Buddy System
(iii) Simple Paging

(b) Consider the following page reference string: **(5)**
7,2,3,1,2,5,3,4,6,7,7,1,0,5,4,6,2,3,0,1.
Assuming demand paging with three frames, how many page faults would occur for the following replacement algorithms?
(i) LRU replacement
(ii) MFU replacement
(iii) Optimal replacement

(c) Why is Paging faster than Segmentation? **(2.5)**

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UNIT-II

Q4 (a) Consider the I/O wait percentage, ω, of a process is the percentage of time the process waits for I/O to complete when executed in a monoprogrammed environment. On a system using round robin scheduling with n processes, all having the same I/O wait percentage, what percentage of the time will the CPU be idle? **(7)**

(b) Assume that two tasks, T1 and T2 share the integer variables X, Y initially set to 0. **(3)**

Task T1 executes:	**Task T2 executes:**
X:=0;	Y:=0;
If X>0 then	while Y<2 do
X;=X+1;	X:=X-1;
Y:=2;	Y:=1;

What are the possible values of X and Y when these tasks terminate?

(c) What resources are used when a thread is created? How do they from those when a process is created? **(2.5)**

Q5 (a) Show how the Bakery algorithm satisfies the requirements of a mechanism to control access to a critical section. **(6)**

(b) Consider the following set of processes, with the length of the CPU burst given in milliseconds: **(6.5)**

Process	**Burst Time**	**Priority**
P_1	2	2
P_2	1	1
P_3	8	4
P_4	4	2
P_5	5	3

The process are assumed to have arrived in the order P_1, P_2, P_3, P_4, P_5 all at time 0. Answer the following questions using the following scheduling algorithms: FCFS, SJF, Priority and RR(quantum=2)

(i) Draw Gantt chart that illustrates the execution of these processes.

(ii) What is the turnaround time of each process for each of the scheduling algorithm?

(iii) What is the waiting time of each process for each of the scheduling algorithm?

UNIT-III

Q6 (a) Consider a system with the following current resource-allocation state: **(6)**
There are five processes: P0, P1, P2, P3, P4 and three resource types: A, B, and C. For each process, the current allocation and the maximum required allocation are given by Allocation and MAX matrices. The current available resource are given by the Available vector.
Answer the following questions using the Banker's algorithm:

Processes	**Allocation**			**Max**			**Available**		
	A	B	C	A	B	C	A	B	C
P0	1	1	2	4	3	3	2	1	0
P1	2	1	2	3	2	2			
P2	4	0	1	9	0	2			
P3	0	2	0	7	5	3			
P4	1	1	2	11	2	3			

(i) What is the content of the Need matrix?

(ii) Determine if this state is "safe" using Safety algorithm.

(iii) If a request from process P_3 arrives for (7, 2, 3), can the request be granted immediately?

(b) Why will deadlock probably be a more critical problem in future operating systems than it is today? Justify your answer. **(2)**

P.T.O.

(c) What is Indefinite Postponement? How does Indefinite Postponement differ from deadlock? How does Indefinite Postponement similar to deadlock? Discuss the consequences of IP in the following types of Systems: **(4.5)**
(i) Batch processing
(ii) Time sharing
(iii) Real time

Q7 (a) Given the following track requests in the disk queue for a 100 track disk (0-99), compute for the Total Head Movement (THM) of the read/write head: **(6)**
33, 72, 47, 8, 99, 74, 52, 75.
Consider that the read/write head is initially positioned at cylinder 63. Prior to this, track location 99 was serviced. Show the total head movement for the following scheduling algorithms:
(i) FCFS
(ii) SSTF
(iii) SCAN
(iv) C-SCAN
(v) LOOK

(b) Consider a disk having 8 surfaces, each surface is having an outer diameter of 16 cm and an inner diameter of 6 cm and the inner track space is 0.2 mm. there are 32 sectors in each track. If the disk addresses for reading a byte of a sector on any surface track of the disk is 27 bits. **(3)**
(i) What is the sector size in bytes?
(ii) If the disk rotates at 3600 rpm, what is the effective data transfer rate in bytes/sec?

(c) What do you mean by Sector queuing? Describe SPTF algorithm. **(3.5)**

UNIT-IV

Q8 (a) Consider a file system on a disk that has both logical ad physical sizes of 512 bytes. Assume that the information about each file is already in memory. For each of the three allocation strategies (contiguous, linked, and indexed), answer the following questions: **(6)**
(i) How the logical to physical address mapping accomplished in this system? (For indexed allocation, also assume that a file is always less than 512 blocks long). Assume a pointer size of 1 byte.
(ii) If we are currently at logical block 10 and want to access logical block 4, how many physical blocks must be read from the disk?

(b) Discuss various techniques for implementing File Access Control. Which technique is appropriate for most of the systems? **(4)**

(c) How operating system manages mounted file systems? **(2.5)**

Q9 (a) Explain various file allocation methods with their pros and cons. **(6.5)**

(b) How does support for having file with multiple names complicate the deletion operation on a file system? **(3)**

(c) Why DOS and UNIX operating systems recognize only executable files? **(3)**

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