~~Set B~~

Sl. No. of Q.P: 8701

2/12/19M

Unique Paper Code	:	**2341301**
Name of the Course	:	**B. Tech. (Computer Science)**
Name/title of the Paper	:	**Operating Systems**
Semester	:	**III**
Duration	:	**3 hours**
Maximum Marks	:	**75**

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Instructions for candidates:

Section A is compulsory. Attempt any 4 questions from section B. Parts of a question must be answered together.

(Section A)

Q1

a. Briefly explain the concept of dual mode of operations. (3)

b. Consider the following code segment:

```
int p = fork();
if (p == 0)
   cout<< "\nIn child";
else {
   wait(NULL);
   cout<< "\nIn parent";
}
```

(i) What will be the output of the code segment? (2)

(ii) What are the possible outputs if wait() statement is removed? Give reason. (3)

c. Consider a paging system with the page table stored in memory.

(i) if a memory reference takes 125 nanoseconds, how long does a paged memoryreference take? (1)

(ii) if we add TLBs and 80% of all page table references are found in the TLBs, what is the effective memory access time? Assume that the time taken to access a TLB is 20nanoseconds. (2)

d. With the help of a diagram, explain the five states of a process. (6)

e. What is the function of short-term scheduler? How is it different from long term scheduler? (3)

f.. What are real time embedded systems? Where are they used? Give examples. (3)

g. What is indexed allocation of disk blocks? What are its advantages and disadvantages? (4)

h. Consider the following segment table:

Segment	Base	Length
0	200	600
1	1200	20
2	40	150

What are the physical addresses for the following logical addresses?

(1) 0, 700 (2) 2, 10 (2)

i. Differentiate between the following: (6)

(1) External and internal fragmentation
(2) Paging and demand paging
(3) Tree structured Directories and Acyclic-Graph directories

(Section – B)

Q2 a. Consider the following set of processes, with the length of CPU burst time given in milliseconds:

Process	Arrival Time	Burst Time	Priority
P_1	0	2	2
P_2	1	5	1 (Highest)
P_3	3	2	3
P_4	5	1	4

(i) Draw Gantt chart for Shortest Job First algorithm and calculate turnaround time for every process.

(ii) Draw Gantt chart for Priority based (preemptive) algorithm and calculate waiting time for every process. (6)

b. Suppose there is a system with 128KB of memory with no memory initially allocated. Given the following sequence of requests by the processes, show the memory layout at intermediate stages for best-fit allocation algorithm. (4)

Process Number	**Nature of Request**	**Amount of memory requested (in KB)**
P0	Allocation	30
P1	Allocation	10
P2	Allocation	15
P3	Allocation	22
P0	Deallocation	
P2	Deallocation	
P4	Allocation	8
P5	Allocation	10

Q3 a. A system has 3 processes P1, P2 and P3, and 3 resources R1, R2 and R3. There are 2 instances each of R1 and R2, and one instance of R3. Given the edge set E = {R1 → P1, R2 → P2, P1 → R3, R1 → P2, P3 → R1, R2 → P3, R3 → P3}.

(i) Draw the resource allocation graph. (3)

(ii) Is the system in a deadlock? If the answer is yes, then mention the processes in the deadlock else identify the sequence in which the processes can execute. (2)

b. Consider the following page reference string

0 3 1 5 7 6 5 7 2 2 7 0 4 7 3 2 1 2 1

How many page faults would occur with FCFS and optimal page replacement algorithms assuming three frames? All frames are initially empty. (5)

Q4 a. A UNIX file system has 1-KB blocks and 4-byte block addresses. What is the maximum file size if inode contains 10 direct entries, and one single and double indirect entries each? (4)

b. Explain many-to-one, one-to-one and many-to-many multithreading models. (6)

Q5 a. Consider a logical address space of 64 pages with 2-KB frame size mapped onto a physical memory of 256 KB.

(i) How many bits are there in the logical and physical addresses? (2)

(ii) What is the breakup of offset and page number in the logical address and physical addresses? (4)

b. Explain the two methods of inter-process communication. (4)

Q6 a. Suppose a disk drive has 200 cylinders numbered from 0 to 199. The request for 46 is being serviced and is moving towards track 199 and the disk request queue contains read/write requests for the sectors on tracks 112, 155, 43, 126 and 197, respectively. What is the total number of head movements needed to satisfy the requests in the queue using:

(i) FCFS

(ii) LOOK (3 + 2)

b. Can use of semaphores lead to deadlocks? Justify your answer. (2)

c. If the total number of frames in main memory is 60 and there are 4 processes in the system with the demand as 30, 10, 100 and 60 frames, respectively. What will be the number of frames allocated using the following allocation strategies?

(i) equal allocation (1)

(ii) proportional allocation (2)

Q7 a. Describe the reader-writer synchronization problem. Suggest the process structures to solve this problem. (5)

b. Explain the inverted and hashed page tables. (5)