B. Tech-5th(IT)

Operating System

Full Marks : 50

Time : $2\frac{1}{2}$ hours

Answer **all** questions

The figures in the right-hand margin indicate marks

Symbols carry usual meaning

1. Answer *all* questions : 2×5

(*a*) What do you mean by CPU Burst time and I/O Burst time of a process.

(*b*) State any four events that may lead to process context switch in a time-sharing operating system.

(*c*) State two ways in which the processor mode can be changed from user mode to supervisor mode.

(*d*) We need special support from the hardware to provide mutual exclusion among a number of concurrent processes. Justify the statement.

(*e*) Why is thread scheduling faster than process scheduling ?

2. (*a*) Discuss about hard and soft real time system with example and application. 4

(*b*) The primary objective of multiprogramming is to minimize user response time, while the primary objective of time sharing is to maximize processor utilization. Justify or contradict. 4

Or

(*a*) What is a process ? What are the different states of a process ? Explain with a neat

diagram with respect to process state transition diagram, explain under what circumstances the following state transitions take place ? 4

(*i*) Running to Ready

(*ii*) Running to Waiting

(*iii*) Waiting to Ready.

(*b*) Write short notes on : 4

(*i*) Buffering

(*ii*) Privileged instruction.

3. (*a*) Justify with reasons whether the following CPU scheduling algorithms can result in process starvation :

(*i*) First-come first-serve

(*ii*) Shortest-job next. 4

(*b*) Consider the following set of processes. Calculate the average waiting time and average turnaround time for the following scheduling algorithms :

(*i*) FCFS

(*ii*) non-preemptive SJF

(*iii*) pre-emptive SJF, and

(*iv*) round-robin with time quantum of 3 msec.

Process	P1	P2	P3	P4	P5	P6
Arrival Time (msec)	0	2	3	5	6	8
CPU Burst (msec)	7	4	6	2	8	5

Or

(*a*) What is scheduling ? What criteria affect the scheduler's performance ? 4

(*b*) Suggest a CPU scheduling algorithm that tries to reduce the waiting time of the processes and at the same time avoids starvation. Comment on whether the algorithm will give preference to processes with short CPU bursts or long CPU bursts. 4

4. (*a*) Clear explain the differences between the following with the help of examples :

(*i*) System call

(*ii*) Exception

(*iii*) Internal hardware interrupt. 4

(*b*) When does a page fault occur ? Explain pros and cons of various page replacement strategies/algorithms. 4

Or

(*a*) Explain Demand paging with proper diagram. 4

(*b*) Consider a demand paging system with four-page frames (initially empty) and LRU page replacement policy. For the following page reference string find the page fault rate which is defined as the ratio of number of page faults to the number of memory accesses (rounded off to one decimal place) ?

Page reference string : 4

7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 3.

5. (*a*) Three concurrent processes P1, P2 and P3 are concurrently updating a shared variable *xyz* (with initial value of 100) as follows :

P1 : $xyz = xyz + 10$;
P2 : $xyz = xyz - 20$;
P3 : $xyz = xyz * 2$;

What will be the maximum and minimum values of *xyz* after execution of the three processes ? 4

(*b*) With respect to two concurrent processes, explain how race condition can occur with the help of an example. 4

Or

(*a*) Explain page segmentation with a neat diagram and example. 4

(*b*) Explain Belady's anomaly with example in page replacement algorithm. In which algorithm it is used and why ? 4

6. (*a*) Disk requests come to a disk driver for cylinders in the order 10, 22, 20, 2, 40, 6 and 38 at a time when the disk drive is reading from cylinder 20. The seek time is 6 ms/cylinder. Calculate the total seek time, if the disk arm scheduling algorithms is first-come-first-served is used. 4

(*b*) Find the total number of frames. If a system, size of the main memory is 2^{30} bytes, the page size is 4 KB and the size of each page table entry is 32-bit. 4

Or

(*a*) If there are 6 units of resource R in the system and each process in the system requires 2 units of resource R, then how many processes can be present at maximum so that no deadlock will occur ? 4

(*b*) In a virtual memory system, size of virtual address is 32-bit, size of physical address is 30-bit, page size is 4 Kbyte and size of each page table entry is 32-bit. The main memory is byte addressable. Calculate the maximum number of bits that can be used for storing protection and other information in each page table entry ? 4