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BTech Cse 'D'

Operating System Assignment 01

Part - A.

Ans 1. Modern systems rely on OS because it abstracts hardware complexity, manage resources (CPU, memory, I/O), provides security, multitasking, & ensures user friendly interaction. Without OS, applications would need to handle hardware directly, making development inefficient.

Ans. 2. A Real-Time Operating System (RTOS) is suitable because it provides fast, predictable responses with low latency, which is critical for health monitoring where timely alerts may save lives.

Ans-3 Avoid layered structure because its strict layer-by-layer communication introduces overhead & delays; reducing performance. Performance-critical enviornments needs fast, direct communication (e.g. monolithic or optimized microkernal).

Ans. 4 Refute. OS structure impacts performance, reliability, maintainability, & structure. Poor structure can cause bottlenecks, debugging difficulties, & vulnerabilities even if processes "run".

Ans5.i) Analysing PCB helps check saved registers, program counter, & state flags; errors here reveal uninitialized registers or invalid states

ii) Context switching involves saving CPU state of the running process into its PCB & loading the next process's state from its PCB.

iii) Use asynchronous system call because I/O requests shouldn't block execution; it allows the process to continue while I/O completes in the background

PART-B

Ans.6 a) Total content switching time,

save state = 2 ms

Load state = 3 ms

Scheduler overhead = 1 ms

Total time = 2 + 3 + 1 = 6 ms

b Impact: More context switch time reduces CPU utilization & slows multitasking since more time is spent switching than executing.

Ans.7
- Single threaded = 40sec

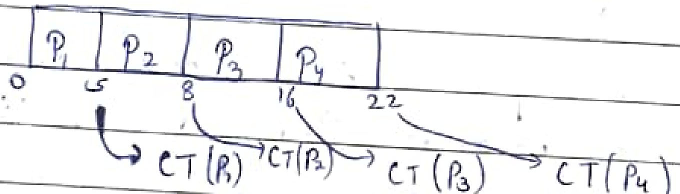
  Assuming 4 threads: Exeution = 40/4 = 10Sec
  (ideal, ignoring overhead)
- Multithreading improves performance by overlapping computation & I/O, reducing idle CPU cycles, & utilizing multiple cores.

Ans. 8 a) FCFS.

Process	Arrival Time (AT)	Burst Time (BT)	Completion Time (CT)	Waiting Time (WT)	TAT
P1	0	5	5	5-5 = 0	5-0 = 5
P2	0	3	8	8-3 = 5	8-0 = 8
P3	0	8	16	16-8 = 8	16-0 = 16
P4	0	6	22	22-6 = 16	22-0 = 22

WT = Turnaround - Burst (TAT - BT)
TAT = Completion - Arrival (CT - AT)

Grantt chart,

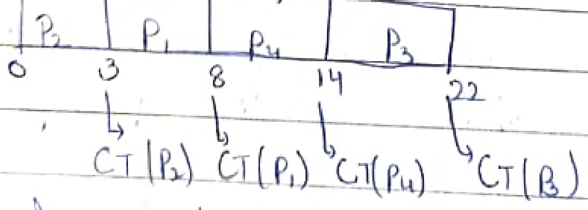


Avg waiting time = (0 + 5 + 8 + 16) / 4 = 7.25 ms
Avg turnaround time = (5 + 8 + 16 + 22)/4 = 12.75ms

b) Non-premtive SJF

TAT = CT - AT
WT = TAT - BT.

Grantt chart,



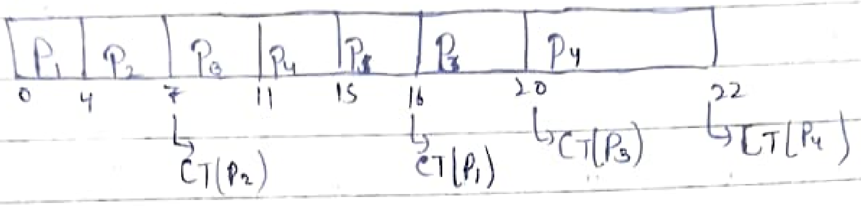
Avg waiting Time = (3+0 +14+8)/4 = 6.25ms
Avg turn around time = (8 + 3 + 22 + 14)/4 = 11.75 ms

c) Round Robin (Quantum 4ms)

WT = TAT - BT

TAT = CT - AT

Grantt chart,



Avg waiting time = (11+4+12+16)/4 = 10.75 ms

Avg turnaround = (16 + 7 + 20 + 22)/4 = 16.25 ms

∴ Non Preemptive SJF is best algorithm because SJF balances throughput & turnaround best because it minimizes averages waiting & turnaround time.

Ans 9. i) Cloud Migration:

- Choose Micro Kernel for scalability & security, since it isolates services (drivers, file system, etc) in user mode, reducing crashes & improving modularity.
- VMs provide isolation (sandboxing), efficient resources allocation, & easy migration/management.

ii) Smart Home OS:

- OS uses priority based scheduling + IPC to ensure critical tasks (intrusion detection) preempt less critical ones.
- Suitable algorithms: Priority Scheduling (for critical tasks) or Earliest Deadline First (EDF) for real-time responses.