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Date __/__/____

Saathi

Operating System Assignment 1

Q1.
Ans Even with advanced hardware, OS is essential for resource management (CPU, memory, I/O). It provides abstraction, multitasking, security and ensure programs can run safely and efficiency.

Q2.
Ans A real-time embedded operating system is best because the device needs quick and predictable response, low power usage, and small footprint.

Q3.
Ans Avoid microkernel, as frequent inter-process communication adds overhead. Monolithic or layered gives better raw performance.

Q4.
Ans Yes, Structure impacts performance maintainability and fault isolation. for example, micro-kernel is secure but slower, monolithic is faster but less reliable.

Q5.
Ans (i) PCB stores registers PC and state → errors show uninitialized values.
(ii) Context switch = saving current process state, updating PCB, loading new state.
(iii) Mid-execution I/O allocation usually needs non-blocking call so process continues running.

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Part - B

Q 6.

Ans (a) Total context switching time,

Save State = 2ms

Load State = 3ms

Scheduler overhead = 1ms

Total time = 2 + 3 + 1 = 6ms

b) • Context switching is pure overhead (no useful work is done during this time).

• Higher switching time reduces CPU efficiency, as more time is spent switching than executing process.

Q 7.

Ans Execution time estimate :

In ideal conditions (perfect parallelism, no overhead)

$$T_{multi} = \frac{T_{single}}{n} = \frac{40}{n} \text{ seconds}$$

single-thread = 40 sec

With 2 threads under ideal cond^n = $\frac{40}{2}$ = 20 sec.

Q 8.

Ans

Process :	P_1	P_2	P_3	P_4
Burst Time :	5	3	8	6

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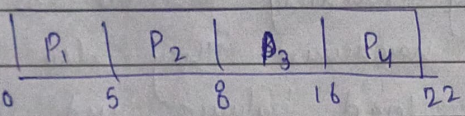
(a) FCFS

Process	Arrival Time (At)	Burst Time (Bt)	Completion Time (ct)	Waiting time (wt)	TAT
P_1	0	5	5	5-5=0	5
P_2	0	3	8	8-3=5	8
P_3	0	8	16	16-8=8	16
P_4	0	6	22	22-6=16	22

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

Gruatt chart

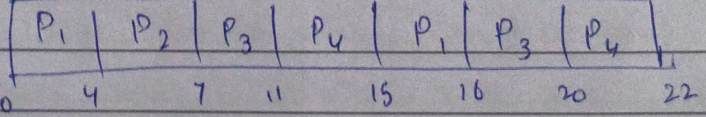


Avg. waiting Time = (0+5+8+16)/4 = 7.25 ms
Avg. turnaround time = (5+8+16+22)/4 = 12.75 ms

(c) Round - Robin (quantum = 4ms)

Process	At	BT	CT	WT	TAT
P_1	0	5	16	16-5=11	16-0=16
P_2	0	3	7	7-3=4	7-0=7
P_3	0	8	20	20-8=12	20-0=20
P_4	0	6	22	22-6=16	22-0=22

Gruatt Chart,



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Avg waiting time = (11+4+12+16) / 4 = 10.75 ms
Avg turnaround = (16+7+20+22) / 4 = 16.25 ms

SJF gives lowest waiting and turnaround times, while RR improves fairness for interactive tasks.

Qa.
Ans (i) Cloud migration :

For a virtualized cloud, a microkernel is suitable since it separate core services and provides better security and scalability. Virtual machines (VMs) add isolation by running multiple os instance on the same hardware. They also support resource sharing, load balance and living migration.

(ii) Smart home systems :
Here, many IOT devices run together. The OS uses priority scheduling and IPC so urgent tasks like intrusting detection get CPU immediately, while low-priority scheduling and IPC so urgent takes like intrusion detection get CPU immediately, which low-priority tasks like lighting wait. Algorithms such as EDF (Earliest Deadline first) or RMS (Rate Monotonic Scheduling) can ensure critical tasks meets their deadlines without starving background process.

Sethi 21/11/24