UNIVERSITY COMPUTER SCIENCE • EXERCISE SHEET

7.2 Scheduling

Name: _____ Class: _____ Date: _____ **Total: 24 marks**

KEY WORDS turnaround time • round robin

Objective

Compute the three policies' tables for a given job set, exactly.

1 Key knowledge and worked examples

■ **The metrics**

Turnaround = finish − arrival; waiting = turnaround − burst ✓. The course set (7, 4, 1, 4 at time 0): FCFS average 11.5, SJF 7.75, RR ($q = 2$) 11.25 ✓.

■ **Worked example: the RR trace**

P1 P1 | P2 P2 | P3 | P4 P4 | P1 P1 | P2 P2 | P4 P4 | P1 P1 | P1 – nine segments; finishes P3 = 5, P2 = 11, P4 = 13, P1 = 16 ✓.

2 Practice

2.1 Bursts 6, 3, 2 arriving at 0 under FCFS: give the finishes and the average turnaround. [3]

2.2 The same set under SJF: give the order and the average turnaround. [3]

2.3 A 1 µs switch in a 100 µs quantum wastes what percentage? [3]

3 Exam-style questions

3.1 Four jobs arrive at time 0 with bursts P1 = 8, P2 = 4, P3 = 2, P4 = 4.

Build the FCFS table (finishes, turnarounds, average) in arrival order. Build the SJF table and its average. Build the round-robin table with quantum 2 (give the first six segments of the trace), and state each policy's average turnaround. Name which job suffers most under FCFS and by how much its wait exceeds its SJF wait. [8]

3.2 A switch costs 2 µs.

Compute the percentage of CPU spent switching under round robin with quanta of 50 µs, 500 µs, and 5 ms. State the quantum a system should avoid and why, in one line each. Compute how many switches the course RR trace (nine segments) implies, and its total switch cost. [7]

Solutions

2.1

- Finishes $6, 9, 11$ ✓.
- Turnarounds $6, 9, 11$ – average $26/3 \approx 8.67$ ✓.

2.2

- SJF order: P3 (2), P2 (3), P1 (6) ✓.
- Finishes $2, 5, 11$; average $18/3 = 6$ ✓.

2.3

- $1/100 = 1\%$ ✓.

3.1

- FCFS finishes $8, 12, 14, 18$; turnarounds the same (arrivals 0); average $52/4 = 13$ ✓.
- SJF order P3, P2, P4, P1: finishes $2, 6, 10, 18$; average $36/4 = 9$ ✓.
- RR ($q = 2$) first segments: P1 P1 | P2 P2 | P3 | P4 P4 | P1 P1 | P2 P2 ✓.
- RR finishes P3 = 6, P2 = 12, P4 = 14, P1 = 18: average $50/4 = 12.5$ ✓.
- Sufferer: P3 (burst 2) waits 12 under FCFS against 0 under SJF – 12 more ✓.

3.2

- $2/50 = 4\%$; $2/500 = 0.4\%$; $2/5000 = 0.04\%$ ✓.
- Avoid the 50 µs quantum: 4% of the CPU spent on switching is work that progresses nothing ✓.
- Nine segments imply 8 switches ✓.
- Total switch cost 8×2 µs $= 16$ µs ✓.

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