Question 1:

A white paper with black text

Description automatically generated

A. Draw 4 Gantt Charts for FCFS, SJF, Non-Preemptive, RR (q=1)

**1. First Come First Serve –** executed by order they arrive

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| P1 | P2 | P3 | P4 | P5 |

0 10 11 13 14 19

**2. Shortest Job First –** sort by burst time (shortest first), same burst – arrival time first

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| P2 | P4 | P3 | P5 | P1 |

0 1 2 4 9 19

**3. Non preemptive priority –** executed by priority (smaller = first), if small then arrive time first

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| P2 | P5 | P1 | P3 | P4 |

0 1 6 16 18 19

**4. Round Robin (quantum 1) =** each process gets a time slice of 1ms till all are done

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| P1 | P2 | P3 | P4 | P5 | P1 | P3 | P5 | P1 | P5 | P1 | P5 | P1 | P5 | P1 | P1 | P1 | P1 | P1 |

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

B. What is the turnaround time for each process? TAT = completion time – arrival time

1. FCFS

|  |  |  |  |
| --- | --- | --- | --- |
| Process ID | Completion time | Arrival time | Turn Around Time |
| P1 | 10 | 0 | 10 |
| P2 | 11 | 0 | 11 |
| P3 | 13 | 0 | 13 |
| P4 | 14 | 0 | 14 |
| P5 | 19 | 0 | 19 |
| TOTAL |  |  | 67 |

Average Turn Around time: 67/5 = 13.4

2. SJF

|  |  |  |  |
| --- | --- | --- | --- |
| Process ID | Completion time | Arrival time | Turn Around Time |
| P2 | 1 | 0 | 1 |
| P4 | 2 | 0 | 2 |
| P3 | 4 | 0 | 4 |
| P5 | 9 | 0 | 9 |
| P1 | 19 | 0 | 19 |
| TOTAL |  |  | 35 |

Average Turn Around time: 35/5 = 8.75

3. Priority

|  |  |  |  |
| --- | --- | --- | --- |
| Process ID | Completion time | Arrival time | Turn Around Time |
| P2 | 1 | 0 | 1 |
| P5 | 6 | 0 | 6 |
| P1 | 16 | 0 | 16 |
| P3 | 18 | 0 | 18 |
| P4 | 19 | 0 | 19 |
| TOTAL |  |  | 60 |

Average Turn Around time: 60/5 = 12

4. RR (quantum=1)

|  |  |  |  |
| --- | --- | --- | --- |
| Process ID | Completion time | Arrival time | Turn Around Time |
| P1 | 19 | 0 | 19 |
| P2 | 2 | 0 | 2 |
| P3 | 7 | 0 | 7 |
| P4 | 4 | 0 | 4 |
| P5 | 14 | 0 | 14 |
| TOTAL |  |  | 46 |

Average Turn Around time: 46/5 = 9.2

C. What is the waiting time for each process? Waiting time = turnaround time – burst time

1. FCFS

|  |  |  |  |
| --- | --- | --- | --- |
| Process ID | Turn Around Time | Burst Time | Waiting Time |
| P1 | 10 | 10 | 0 |
| P2 | 11 | 1 | 10 |
| P3 | 13 | 2 | 11 |
| P4 | 14 | 1 | 13 |
| P5 | 19 | 5 | 14 |
| TOTAL |  |  | 48 |

Average Waiting time: 48/5 = 9.6

2. SJF

|  |  |  |  |
| --- | --- | --- | --- |
| Process ID | Turn Around Time | Burst Time | Waiting Time |
| P2 | 1 | 1 | 0 |
| P4 | 2 | 1 | 1 |
| P3 | 4 | 2 | 2 |
| P5 | 9 | 5 | 4 |
| P1 | 19 | 10 | 9 |
| TOTAL |  |  | 16 |

Average Waiting time: 16/5 = 3.2

3. Priority

|  |  |  |  |
| --- | --- | --- | --- |
| Process ID | Turn Around Time | Burst Time | Waiting Time |
| P2 | 1 | 1 | 0 |
| P5 | 6 | 5 | 1 |
| P1 | 16 | 10 | 6 |
| P3 | 18 | 2 | 16 |
| P4 | 19 | 1 | 18 |
| TOTAL |  |  | 41 |

Average Waiting time: 41/5 = 8.2

4. RR (quantum=1)

|  |  |  |  |
| --- | --- | --- | --- |
| Process ID | Turn Around Time | Burst Time | Waiting Time |
| P1 | 19 | 10 | 9 |
| P2 | 2 | 1 | 1 |
| P3 | 7 | 2 | 5 |
| P4 | 4 | 1 | 3 |
| P5 | 14 | 5 | 9 |
| TOTAL |  |  |  |

Average Waiting time: 27/5 = 5.4

D. Which of the following had the minimal wait time

Shortest Job First (SJF) had the minimal wait time with 3.2 milliseconds