Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Out of 105 points

1. (10 pts) CPU Scheduling (10pts) First Come First Serve (FCFS)

Consider the following set of processes, with the length of the CPU burst given in milliseconds:

|  |  |  |  |
| --- | --- | --- | --- |
| **Process ID** | **Arrival Time** | **Burst Time** | **Priority** |
| P1 | 0 | 4 | 3 |
| P2 | 1 | 5 | 2 |
| P3 | 3 | 2 | 4 |
| P4 | 12 | 7 | 1 |
| P5 | 13 | 3 | 3 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| P1 | P1 | P1 | P1 | P2 | P2 | P2 | P2 | P2 | P3 | P3 |  | P4 | P4 | P4 | P4 | P4 | P4 | P4 | P5 | P5 | P5 |  | |

For each process compute the following. Show your work:

Wait time

P1: Started at 0 – Arrived at 0 = 0

P2: Started at 4 – Arrived at 1 = 3

P3: Started at 9 – Arrived at 3 = 6

P4: Started at 12 – Arrived at 12=0

P5: Started at 19 – Arrived at 13 = 6

Average: 15/5 = 3

Turnaround time

P1: Finished at 4 – Arrived at 0 = 4

P2: Finished at 9 – Arrived at 1 = 8

P3: Finished at 11 – Arrived at 3 = 8

P4: Finished at 19 – Arrived at 12=7

P5: Finished at 22 – Arrived at 13 = 9

Average 36/5 7/2

1. (10 pts) CPU Scheduling: Shortest Job First (SJF)

Consider the following set of processes, with the length of the CPU burst given in milliseconds:

|  |  |  |  |
| --- | --- | --- | --- |
| **Process ID** | **Arrival Time** | **Burst Time** | **Priority** |
| P1 | 0 | 4 | 3 |
| P2 | 1 | 5 | 2 |
| P3 | 3 | 2 | 4 |
| P4 | 9 | 6 | 1 |
| P5 | 10 | 3 | 3 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |

For each process compute the following. Show your work:

Wait time

Turnaround time

1. (10 pts) CPU Scheduling: Round Robin (RR) with quantum=1

Consider the following set of processes, with the length of the CPU burst given in milliseconds:

|  |  |  |  |
| --- | --- | --- | --- |
| **Process ID** | **Arrival Time** | **Burst Time** | **Priority** |
| P1 | 0 | 4 | 3 |
| P2 | 1 | 5 | 2 |
| P3 | 3 | 2 | 4 |
| P4 | 9 | 6 | 1 |
| P5 | 10 | 3 | 3 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| P1  3 | P2  2 | P2  2 | P2  2 | P2  2 | P2  2 | P1  3 | P1  3 | P1  3 | P4  1 | P4  1 | P4  1 | P4  1 | P4  1 | P4  1 | P5  3 | P5  3 | P5  3 | P3  4 | P3  4 |  |  |  | |
| ARRIVES: Can schedule as soon as it arrives | | | | | | | | | | | |  |  |  |  |  |  |  |  |  |  |  |
| P1 | P2 |  | P3 |  |  |  |  |  | P4 | P5 |  |  |  |  |  |  |  |  |  |  |  |  | |

For each process compute the following. Show your work:

**Wait time**

P1: Started at 0 – Arrived at 0 = 0

P2: Started at 1 – Arrived at 1 = 0

P3: Started at 18 – Arrived at 3 = 15

P4: Started at 9 – Arrived at 9=0

P5: Started at 15 – Arrived at 10 = 5

Average: 20/5 = 4

**Turnaround time**

P1: Finished at 9 – Arrived at 0 = 9

P2: Finished at 6 – Arrived at 1 = 5

P3: Finished at 20 – Arrived at 3 = 17

P4: Finished at 15 – Arrived at 9=6

P5: Finished at 18 – Arrived at 10 = 8

Average 45/5 = 9

1. (10 pts) CPU Scheduling: Round Robin (RR) with quantum=1 **No Priority**

Consider the following set of processes, with the length of the CPU burst given in milliseconds:

|  |  |  |  |
| --- | --- | --- | --- |
| **Process ID** | **Arrival Time** | **Burst Time** | **Priority** |
| P1 | 0 | 4 |  |
| P2 | 1 | 5 |  |
| P3 | 3 | 2 |  |
| P4 | 9 | 6 |  |
| P5 | 10 | 3 |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| P1 | P2 | P1 | P3 | P1 | P2 | P3  F | P1  F | P2 | P4 | P5 | P2 | P4 | P5 | P2  F | P4 | P5  F | P4 | P4 | P4 |  |
| ARRIVES: Can schedule as soon as it arrives ; F final | | | | | | | | | | | |  |  |  |  |  |  |  |  |
| P1 | P2 |  | P3 |  |  |  |  |  | P4 | P5 |  |  |  |  |  |  |  |  |  |

For each process compute the following. Show your work:

**Wait time**

P1: Started at 0 – Arrived at 0 = 0

P2: Started at 1 – Arrived at 1 = 0

P3: Started at 3 – Arrived at 3 = 0

P4: Started at 9 – Arrived at 9=0

P5: Started at 10 – Arrived at 10 = 0

Average: 0/5 = 0

**Turnaround time**

P1: Finished at 8 – Arrived at 0 = 8

P2: Finished at 15 – Arrived at 1 = 14

P3: Finished at 7 – Arrived at 3 = 17

P4: Finished at 20 – Arrived at 9=6

P5: Finished at 17 – Arrived at 10 = 7

Average 52/5 = 10.4