**Q1 (a):**

**Average Turnaround Time using FCFS algorithm:**

Avg Turnaround Time: P1+P2+P3+P4+P5/5

Avg Turnaround Time: 2 + 3 + 11 + 15 +20/5 = 10.2

**Q1 (b):**

**Average Turnaround Time using SJF algorithm:**

Avg Turnaround Time: P2+P1+P4+P5+P3/5

Avg Turnaround Time: 1 + 3 + 7 + 12 +20/5 = 8.6

**Q1 (c):**

**Waiting Time using FCFS algorithm:**

|  |  |
| --- | --- |
| **Process** | **Waiting Time** |
| P1 | 0 |
| P2 | 2 |
| P3 | 3 |
| P4 | 11 |
| P5 | 15 |

**Waiting Time using SJF algorithm:**

|  |  |
| --- | --- |
| **Process** | **Waiting Time** |
| P1 | 1 |
| P2 | 0 |
| P3 | 12 |
| P4 | 3 |
| P5 | 7 |

**Q1 (d):**

**Minimum Average Waiting Time:**

**FCFS:**

Avg Waiting Time = (0+2+3+11+15)/5 = 6.2

**SJF:**

Avg Waiting Time = (1+0+12+3+7)/5 = 4.6(minimum avg waiting time)

**Q1 (code):**

****

**Q2 (bi directional):**

****

**Q4 (fork):**

** **

**Q5 (shell script):**

** **

**Q5d:**

There is no useful concept of pointer in shell script. But bash allows to point indirectly to another variable by using namerefers.

Command : declare –n ref=var (makes reference ref to variable var )