2) Preemptive Mode

Source_Code ::

```
echo $'\n' "5C6 - Amit Singhal (11614802722)" $'\n'


read -p "Enter the number of processes: " num_processes

echo $'\n' "Enter Arrival Time & Burst Time for $num_processes processes"


# Collect process details

for ((i=0;i<num_processes;i++)); do

    echo -n "P$((i+1)): "

    read arrival_time burst_time

    processes[$i]="$arrival_time $burst_time"

    remaining_burst[$i]=$burst_time  # Track the remaining burst time for preemption

    process_completed[$i]=0          # Track if the process is completed

done


# Initialize variables

total_completion_time=0

total_waiting_time=0

total_turnaround_time=0

gantt_chart="0"  # Start Gantt chart at time 0

time=0           # Global time

completed_processes=0
```

```
prev_process=-1  # Track the previously executing process for Gantt chart


# Function to find the process with the shortest remaining burst time among those that have arrived
find_shortest_remaining() {
    local min_burst=-1
    local min_index=-1

    for ((i=0;i<num_processes;i++)); do
        current_process=(${processes[$i]})
        current_arrival_time=${current_process[0]}

        if (( process_completed[$i] == 0 && current_arrival_time <= time )); then
            if (( min_burst == -1 || remaining_burst[$i] < min_burst )); then
                min_burst=${remaining_burst[$i]}
                min_index=$i
            fi
        fi
    done

    echo $min_index
}

# Display table header
```

```
echo -e "\nProcess\t Arrival Time\t Burst Time\t Completion Time\t Turnaround Time\t Waiting Time"


# Process all processes using SRTF (Preemptive SJF)
while (( completed_processes < num_processes )); do
    shortest_job=$(find_shortest_remaining)

    if (( shortest_job == -1 )); then
        # No process available, increase time (idle)
        gantt_chart+=" -- XX -- $((++time))"
    else
        current_process=(${processes[$shortest_job]})
        current_arrival_time=${current_process[0]}
        current_burst_time=${current_process[1]}

        # If a new process is selected or time has changed
        if (( prev_process != shortest_job )); then
            if (( prev_process != -1 )); then
                gantt_chart+=" -- $time"
            fi
            gantt_chart+=" -- P$((shortest_job+1))"
            prev_process=$shortest_job
        fi

        # Execute the shortest job for one unit of time
        remaining_burst[$shortest_job]=$((remaining_burst[$shortest_job] - 1))
```

```
        time=$((time + 1))

        # If the process is completed, update its stats
        if (( remaining_burst[$shortest_job] == 0 )); then
            completion_time=$time
            turnaround_time=$((completion_time - current_arrival_time))
            waiting_time=$((turnaround_time - current_burst_time))

            # Update total values
            total_completion_time=$completion_time
            total_waiting_time=$((total_waiting_time + waiting_time))
            total_turnaround_time=$((total_turnaround_time + turnaround_time))

            # Mark the process as completed
            process_completed[$shortest_job]=1
            completed_processes=$((completed_processes + 1))

            # Display process details
            echo -e "P$((shortest_job+1))\t\t$current_arrival_time\t\t$current_burst_time\t\t$completion_time\t\t\t$turnaround_time\t\t\t$waiting_time"
        fi
    fi
done

# End Gantt chart with the last completion time
```

```
gantt_chart+=" -- $time"


# Calculate averages

avg_waiting_time=$(awk "BEGIN {printf \"%.2f\", $total_waiting_time/$num_processes}")

avg_turnaround_time=$(awk "BEGIN {printf \"%.2f\", $total_turnaround_time/$num_processes}")


# Display Gantt chart

echo -e "\nGantt Chart:"

echo -e "$gantt_chart"


# Display averages

echo ""

echo "Avg waiting time: $avg_waiting_time"

echo "Avg turnaround time: $avg_turnaround_time"
```

Output ::

```
singhal-amit@singhal-amit-ThinkPad-T430:~$ vi prg_7.2_sjf.sh
singhal-amit@singhal-amit-ThinkPad-T430:~$ chmod +x prg_7.2_sjf.sh
singhal-amit@singhal-amit-ThinkPad-T430:~$ ./prg_7.2_sjf.sh

 5C6 - Amit Singhal (11614802722)

Enter the number of processes: 6

 Enter Arrival Time & Burst Time for 6 processes
P1: 5 9
P2: 4 8
P3: 3 7
P4: 2 7
P5: 5 8
P6: 6 9

Process  Arrival Time    Burst Time      Completion Time         Turnaround Time         Waiting Time
P4              2               7               9                       7                       0
P3              3               7               16                      13                      6
P2              4               8               24                      20                      12
P5              5               8               32                      27                      19
P1              5               9               41                      36                      27
P6              6               9               50                      44                      35

Gantt Chart:
0 -- XX -- 1 -- XX -- 2 -- P4 -- P4 -- 9 -- P3 -- P3 -- 16 -- P2 -- P2 -- 24 -- P5 -- P5 -- 32 -- P1 -- P1 -- 41 -- P6 -- 50

Avg waiting time: 16.50
Avg turnaround time: 24.50
```