

Istanbul Bilgi University  
Department of Computer Engineering

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SPRING, 2021  
Campus: Santral

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**CMPE 312: OPERATING SYSTEMS**

**HW on Processes**

**(Duration:    minutes)**

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**Name :**

**Student ID :**

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**NOTE:** WRITE NEATLY. MARKS WILL BE GIVEN FOR PARTIAL ANSWERS. THEREFORE, SHOW YOUR WORK AND YOUR REASONING. YOU MAY GET EXTRA POINTS FOR AN APPROPRIATE OBSERVATION OR YOU MAY LOSE SOME MARKS DUE TO AN OBSCURE SOLUTION.

1. {50 points} Early computer systems allowed only one process to be executed at a time. In contrast, current computer systems allow multiple programs to be loaded into memory and executed concurrently. This evolution requires the concepts of 'process', which is a program in execution, and 'process state'.
    - (a) {10 points} Draw the Seven-State Process Model, and
    - (b) {10 points} Explain "when" or "why" a process moves from one state to an other.
    - (c) {15 + 15 points} Knowing that at time  $t$ , processes  $P_1$ ,  $P_5$  and  $P_2$  are in the ready state, and process  $P_7$  is waiting for the disk to complete its service; use process control blocks (PCB) and queue structures to draw the interesting queues of the system at time ' $t$ ', and at time ' $t+1$ ', when the request of process  $P_7$  is completed.
  2. {50 points} Consider the following set of processes with the length of next CPU burst given in milliseconds:  $P_1$  - 8 ms,  $P_2$  - 2 ms,  $P_3$  - 15 ms,  $P_4$  - 5 ms:
    - (a) {5+5 points} Draw the Gantt chart illustrating the execution of these processes using the NON pre-emptive Shortest Job First scheduling algorithm, and calculate the average waiting time.
    - (b) {10+10 points} Knowing the arrival time:  $P_1$ -0,  $P_2$ -3,  $P_3$ -5,  $P_4$ -7, draw the Gantt chart and calculate the average waiting time for the equivalent pre-emptive algorithm, the Shortest Remaining Time First scheduling algorithm.
    - (c) {10+10 points} Compare the number of context switches of the two scheduling algorithms:
      - How many context switches do you have in the 1st and in the 2nd algorithm?
      - Which is the best one?
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