İstanbul Bilgi University

Department of Computer Engineering

SPRING, 2021

Campus: Santral

CMPE 312: OPERATING SYSTEMS

Quiz 1 - Morning Section

(Duration: 60 minutes)

Name :

Student ID :

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.

CONTINUED

1. {100 points} Main Memory (MM) and Central Processing Unit are important resources of the computer system that must be carefully managed.

(a) {30 points} The part of Operating System (OS) that manages the memory is called Memory Manager. 'Partition' is a memory management scheme, which allocates processes in MM into a unique fixed-size partition; each partition contains exactly one process. When a partition is free, the OS selects a process from the input queue and loads it into the free partition; when the process terminates, the partition becomes available; a free partition is called 'hole'. Please, reply to the following questions by giving your own ORIGINAL and UNIQUE answers:

(i) {10 points} Draw a picture of the Main Memory (MM) divided into A 'assigned partitions' and B 'holes': fix your values for A and B[1], and draw the corresponding MM layout. In the following, P_i, P_j and P_k are three processes residing in MM[2]

(ii) {10 points} Considering the 7 states diagram, answer to the following questions[3]:

A. {2 points} Can P_i be in the 'New' state? Why?

B. {2 points} Can P_j be in the 'Running' state? Why?

C. {2 points} Can P_k be in the 'Ready Suspended' state? Why?

D. {2 points} Can P_i be in the 'Waiting Suspended' state? Why?

E. {2 points} Can P_j be in the 'Terminate' state? Why?

(iii) {5 + 5 points} Knowing that at time t, processes P_i, and P_j are in the ready state, and process P_k is waiting for the magnetic tape 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_k is completed.

(b) {70 points} Consider the following set:
Processes - Next CPU burst time (T):

P1	T1 ms
P2	T2 ms
P3	T3 ms

Fix the length of next CPU burst in milliseconds[4], and answer to the following questions:

(i) {5+5 points} Simulate the NON preemptive First-Come-First-Served scheduling algorithm: draw the Gantt chart illustrating the execution of these processes, and calculate the average waiting time

(ii) {10+10 points} Fix a time quantum, and simulate the corresponding preemptive algorithm, the Round-Robin one: draw the Gantt chart and calculate the average waiting time

(iii) {5+5 points} Compare the number of context switches of the two scheduling algorithms:

A. How many context switches do you have in the 1st and in the 2nd algorithm?

B. Which is the best one?

(iv) {15+15 points} Add the arrival time for every process, and simulate the Round-Robin algorithm again[5]: draw the Gantt Chart and calculate the average waiting time

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[1] A >=3 and B>=1

[2] You can name the other processes as you wish, if any

[3] Please, do always justify your answers. No points without a clear answer with justification

[4] Fix your UNIQUE values for each next CPU burst time Ti, i=1, 2, 3

[5] You may keep the same time quantum of the previous point or you may change it