

## Operating Systems Final Exam (Spring 2015)

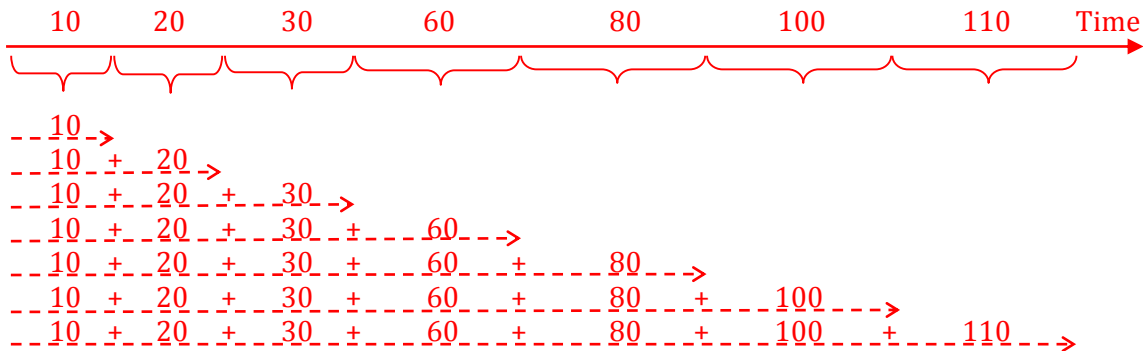
No :

Name:

period: 60 min.

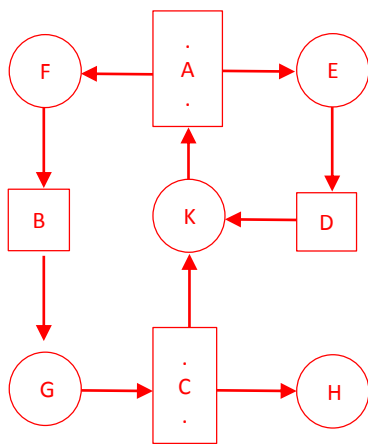
1. (25P) Let's the job queue be "100, 80, 30, 20, 110, 10, 60" minutes. Find turn-around time by using Shortest Job First scheduling algorithm.

"Shortest Job First" algorithm first sort the queue as "10, 20, 30, 60, 80, 100, 110" minutes. Then we can compute turn-around time as:



$$(10 + 30 + 60 + 120 + 200 + 300 + 410) / 7 = 1130 / 7 = 161,43$$

2. (25P) A, B, C, and D are resources. E, F, G, H, and K are processes. A and C can serve two different processes at the same time. F, G, K, E request B, C, A, D respectively, when E, K, F, G, K, H hold A, C, A, B, D, C respectively. Is this situation a deadlock or not? Draw graph model, and explain your answer.



When the graph model is drawn, two circuits are seen. But because process H is not in a circuit, it can run and use resource C. When Process H finish its work, it can release C. Then C can serve G. Therefore the seen circuits can be broken in a certain time. For this reason, it is not a deadlock situation.

3. (25P) By using OPT, how many page faults can a system with 3 frames find on reference string "3, 2, 1, 4, 3, 2, 4, 1, 3, 2, 4, 1"?

|   |   |   |   |      |      |      |   |      |      |   |      |
|---|---|---|---|------|------|------|---|------|------|---|------|
| 3 | 2 | 1 | 4 | 3    | 2    | 4    | 1 | 3    | 2    | 4 | 1    |
| 3 | 3 | 3 | 3 | 3    | 3    | 3    | 3 | 3    | 3    | 4 | 4    |
| - | 2 | 2 | 2 | 2    | 2    | 2    | 2 | 2    | 2    | 2 | 2    |
| - | - | 1 | 4 | 4    | 4    | 4    | 1 | 1    | 1    | 1 | 1    |
| 1 | 2 | 3 | 4 | same | same | same | 5 | same | same | 6 | same |

OPT finds 6 page faults.

4. (25P) Answer the questions below as short as possible.

a. To implement Shortest Remaining Time Next, what need?

Preemptive scheduling algorithm

b. How can we prevent a deadlock for a non-preemptive resource?

By using one of four prevention approaches (spooling, request all resource initially, taking resource away, and ordering resources).

c. What are good and bad things to use only main memory to implement page table?

Hardware cost is good, implementation time performance is bad.

d. What are the problems to use only single level directory?

Naming and grouping problems

e. What is Belady's anomaly?

While the total number of frames in main memory increases, decreasing of the number of page faults is expected. But in First-In First-Out page replacement method, there are some exceptions where this generalization fails. This is called Belady's Anomaly.