Alexandria University
Faculty of Engineering
Comp. & Comm. Engineering
CC373: Operating Systems

جامعة الاسكندرية
كلية الهندسة
برنامج هندسة الحاسب والاتصالات
مادة نظم التشغيل

Sheet9
POLICIES FOR VIRTUAL MEMORY

1) Briefly define the alternative page fetch policies.
2) What is the difference between resident set management and page replacement policy?
3) What is the relationship between FIFO and clock page replacement algorithms?
4) Why is it not possible to combine a global replacement policy and a fixed allocation policy?
5) What is the difference between a resident set and a working set?
6) What is the difference between demand cleaning and precleaning?
7) Consider the following string of page references 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2. Complete a figure similar to Figure 8.14, showing the frame allocation for:
   a) FIFO (first-in-first-out)
   b) LRU (least recently used)
   c) Clock
   d) Optimal (assume the page reference string continues with 1, 2, 0, 1, 7, 0, 1)
   e) List the total number of page faults and the miss rate for each policy. Count page faults only after all frames have been initialized.
8) A process references five pages, A, B, C, D, and E, in the following order:
   $$A; B; C; D; A; B; E; A; B; C; D; E$$
   Assume that the replacement algorithm is first-in-first-out and find the number of page transfers during this sequence of references starting with an empty main memory with three page frames. Repeat for four page frames.
9) A process contains eight virtual pages on disk and is assigned a fixed allocation of four page frames in main memory. The following page trace occurs:
   1, 0, 2, 2, 1, 7, 6, 7, 0, 1, 2, 0, 3, 0, 4, 5, 1, 5, 2, 4, 5, 6, 7, 6, 7, 2, 4, 2, 7, 3, 3, 2, 3
   a) Show the successive pages residing in the four frames using the LRU replacement policy. Compute the hit ratio in main memory. Assume that the frames are initially empty.
   b) Repeat part (a) for the FIFO replacement policy.
   c) Compare the two hit ratios and comment on the effectiveness of using FIFO to approximate LRU with respect to this particular trace.
10) Consider a page reference string for a process with a working set of M frames, initially all empty. The page reference string is of length P with N distinct page numbers in it. For any page replacement algorithm,
    a) What is a lower bound on the number of page faults?
    b) What is an upper bound on the number of page faults?

How to submit the homework assignments?

- Solve the sheet individually without looking up the solution on the Internet. The sheet is to practice; it is a learning tool not an exam.
- Assignments are to be **handwritten**.
- Papers are to be scanned (I like camscanner app). Put all images in a pdf file (camscanner does that for you)
- Use MS Teams to submit
    - o Your filename should be your user id