BIRKBECK, UNIVERSITY OF LONDON

Computer Systems Coursework Part 2

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Answers

1. (a) In uniprogramming jobs runs sequentially.
   Firs job have 20 s CPU time and 60 s I/O time $(20 + 60) = 80$ s
   Second job have 30 s CPU and 60 s I/O time $(30 + 60) = 90$ s
   Third job have 40 s CPU and 60 s I/O time $(40 + 60) = 100$ s
   Overall runtime $= 80 + 90 + 100 = 270$ s

   (b) In multiprogramming CPU time can be allocated to other jobs
   while in I/O process.
   In optimal option job with 40 s CPU time can start first after 40 s
   it will need 60 s I/O time during which 30 s and 20 s jobs can get
   CPU time and I/O time for 20 s job will have the last to finish.
   Overall run time:
   $40 + 30 + 20 + 60 = 150$ s

2. TLB lookup: 100 ns
   TLB update 200 ns
   PT lookup $1\mu s$: 1000 ns
   PT update $2\mu s$: 2000 ns
   Loading word from memory: 10 000 ns
   Loading page from disk: 10^7 ns

   In case of TLB hit:
   $100 + 1000 = 1100$

   In case of TLB miss and in main memory:
   $100 + 1000 + 200 + 10000 = 11300$

   In case of TLB miss and loading from disk:
   $100 + 1000 + 10^7 + 10000 + 2000 + 200 = 10013300$

   Access time: $0.4 \cdot 1100 + 0.6 \cdot (0.3 \cdot 11300 + 0.7 \cdot 10013300)$
   $= 4208060 \approx 4.21 ms$

3. First 40 seconds there is only Type 4 jobs present given each of them
   have run time of 2, in total 20 of this jobs will run. Remaining number
   of Type 4 jobs: 60
   From 40 to 50 seconds Type 1 jobs will arrive and because of their

priority only these jobs will run and total of 10 will run until 50. Remaining number of Type 1 jobs: 10

From 50 to onwards all jobs arrived at the center and until high priori Type 1 and Type 2 jobs all finishes only these jobs will run.

(0 - 40)   :1 (20), 3 (20), 4 (60)
(40 - 50) :1 (10), 2 (30), 3 (20), 4 (60)
(50 - 70) :1 (0), 2 (25), 3 (20), 4 (60)
(70 - 120) :2 (0), 3 (20), 4 (60)
(120 - 160):3(0), 4 (50)
(160 - 260):4(0)

$$\frac{(70-40)+(120-50)+(160-40)+(260-0)}{20+30+20+80} = \frac{480}{150} = 3.2(sec)$$