IMPERIAL COLLEGE LONDON

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING
EXAMINATIONS 2018

EIE PART I: Meng, BEng and ACGI

Corrected copy

INTRODUCTION TO COMPUTER ARCHITECTURE AND SYSTEMS

Tuesday, 5 June 10:00 am

Time allowed: 1:00 hours

There are ONE questions on this paper.

Answer ALL questions.

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Any special instructions for invigilators and information for candidates are on page 1.

Examiners responsible First Marker(s) : T.J.W. Clarke
Second Marker(s) : C. Bouganis

The Questions

The question is on the next two pages

1. a) i) Describe the 4 distinct categories of data used in the execution of a process, detailing for each category whether it is changed by the process, the operating system, or neither.

[2]

ii) A single process makes transitions in the 7 state model as shown labelled A-D in Figure 1.1. State whether each transition is possible, or impossible. If possible explain what single action would make it happen. The order of the transitions A - D need not be considered.

[2]

b) i) Describe how preemptive and non-preemptive scheduling are different.

[2]

ii) For the jobs detailed in Figure 1.2, complete two diagrams showing when each job executes for the two cases: Non-preemptive priority scheduling, and shortest remaining job first scheduling.

[4]

iii) Figure 1.3 shows two execution traces of three non-waiting jobs: A, B and C under two given unknown scheduling methods. Determine whether the scheduling method in each case could be non-preemptive, and whether it could be preemptive. For each answer give a reason for impossibility or a scheduling method that could generate the trace.

[2]

c) Give one advantage, and one disadvantage, of each of the following methods to implement mutual exclusion.

i) Semaphores

ii) Interrupt disabling

[2]

d) Draw diagrams of hardware to implement two distinct logical to physical address translation methods (other than a Translation Look-Aside Buffer) making clear for each how address translation and memory protection are implemented.

[6]

Transition	From	To
A	Running	Waiting
B	Ready	Running
C	Ready-suspend	Ready
D	Ready	Waiting-suspend

Figure 1.1: State Transitions.

Job	Priority	Arrival time (ms)	Duration (ms)
A	3	0	5
B	1	1	6
C	2	2	2
D	4	4	1

Figure 1.2: Four jobs. B has the highest priority.

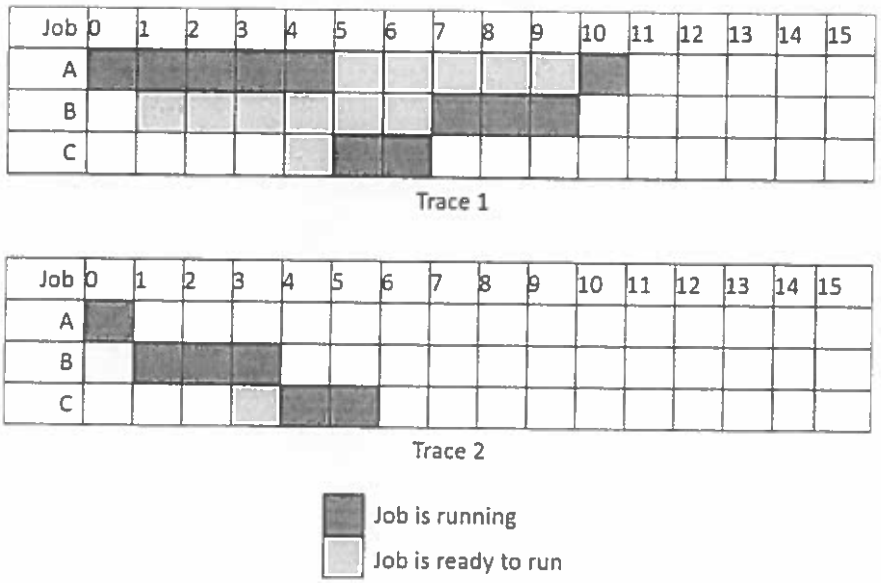

Figure 1.3: Execution traces.