Paper Number(s): **EE1-9B**

IMPERIAL COLLEGE LONDON

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING
EXAMINATIONS 2014

EIE Part I: MEng, BEng and ACGI

Corrected Copy

INTRODUCTION TO COMPUTER ARCHITECTURE AND SYSTEMS (PART B)

OPERATING SYSTEMS

Friday, 13 June 12:00 pm

Time allowed: 1:00 hour

There is ONE question on this paper, which must be answered.

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

Examiners responsible:

First Marker(s): Demiris, Y.K.
Second Marker(s): Bouganis, C.

There is only ONE question below

Answer ALL parts

(a) Consider the following set of processes, with their corresponding arrival times, duration, and priority levels [*higher numbers indicate higher priority*]:

Process	Arrival time (ms)	Duration (ms)	Priority level
A	0	3	1
B	2	2	2
C	5	3	3
D	6	5	4
E	7	2	5

Show the order of execution (including timing information) of the processes if the scheduler implements the following scheduling algorithms:

i. Round-Robin with a time slice of 3 ms [3]
ii. Priority-scheduling with preemption [2]
iii. Shortest Job First (SJF) [2]

For each of the algorithms, enlist their advantages and disadvantages and calculate their average waiting and turnaround times.

(b) In the context of a memory paging system, consider the following scenario:

- You have three available frames
- The reference string is 1-4-5-6-9-4-1-5-4-7

Starting with empty frame contents, show the sequence of frame contents after each request, and count the number of page faults for each of the following page replacement algorithms:

i. Optimal-page replacement [2]
ii. First in First Out page replacement [2]
iii. LRU (Least Recently Used) page replacement [2]

(c) In the context of inter-process synchronization, describe Peterson's solution for ensuring mutual exclusion between the critical regions of two processes [4]

(d) In the context of memory allocation and dynamic partitioning describe the "first-fit", "best-fit", and "worst fit" methods of memory allocation, and list their advantages and disadvantages [3]