

KOLEJ UNIVERSITI TUNKU ABDUL RAHMAN
FACULTY OF APPLIED SCIENCES AND COMPUTING
ACADEMIC YEAR 2014/2015
AUGUST/SEPTEMBER EXAMINATION
COMPUTER SCIENCE AAC5264(A)
OPERATING SYSTEMS AND ADMINISTRATION

MONDAY, 25 AUGUST 2014

TIME: 9.00 AM - 11.00 AM (2 HOURS)

ADVANCED DIPLOMA IN SCIENCE
(INFORMATION SYSTEMS ENGINEERING)

Instructions to Candidates:

Answer **ALL** questions. All questions carry equal marks.

AACS5264(A) OPERATING SYSTEMS AND ADMINISTRATION

Q1. (a) CPU scheduling is the basis for multi-programmed operating systems and used to maximize the CPU utilization. It allows one process to use the CPU while another is waiting for the resources.

(i) Consider the following set of processes, with the CPU time and arrival time given in milliseconds.

Process	Arrival time	CPU time
A	0	15
B	1	2
C	2	3
D	4	1
E	6	5

Illustrate the execution of the processes with a Gantt chart, based on Round Robin (RR). Assume the time quantum is 3 ms and context switch is 1 ms. (Note: the processes A, B, C, D and E with some instances which run on a uniprocessor system, the processes cannot run in parallel). (5 marks)

(ii) Describe the difference between Rate Monotonic and Earliest Deadline First (EDF) scheduling. (4 marks)

(b) A real-time system has 2 processes, A and B with 4 and 3 instances respectively. The table below shows the arrival time, execution time and deadline for each instance of the 2 processes. The period for A and B are 20 and 32 respectively.

Process	Arrival Time (ms)	Execution Time (ms)	Deadline (ms)
A ₁	0	10	20
A ₂	20	10	40
A ₃	40	10	60
A ₄	60	10	80
B ₁	0	14	32
B ₂	32	14	64
B ₃	64	14	96

Show the execution of the processes with Gantt chart based on the following real-time scheduling algorithms:-

(i) Earliest-Deadline First (EDF) (4 marks)

(ii) Rate-Monotonic (RM), assuming that the execution time for each instance of process A has changed to 8 milliseconds (ms) and all other details remain the same. (4 marks)

(c) Identify whether hard or soft real-time scheduling is more appropriate in the following environments. Justify your answer.

(i) Railway traffic control system. (4 marks)

(ii) Multi-players racing game. (4 marks)

[Total: 25 marks]

AACS5264(A) OPERATING SYSTEMS AND ADMINISTRATION

- Q2. (a) Generally, system calls provide an interface to the services made available by an operating system. Discuss the five categories of system calls and give one example of system call for each category.

Assessment Criteria	Marks Allocation
Five categories of system	10 marks
One example of system call for each category	5 marks

(15 marks)

- (b) With the aid of a diagram, illustrate the sequences and discuss how multiple system calls are run when a simple program reads a file from a hard drive and copies it to a floppy drive.

Assessment Criteria	Marks Allocation
Diagram of multiple system calls flow	3 marks
Multiple system calls flow and quality of elaboration	7 marks

(10 marks)

[Total: 25 marks]

- Q3. (a) A page replacement algorithm should minimize the number of page faults. Determine the number of page faults occur for the algorithms below for the following reference string with *four* page frames. Assume all page frames are empty initially.

8, 9, 2, 3, 9, 8, 5, 6, 9, 8, 9, 2, 7, 6, 2, 9, 8, 9, 2, 6

- (i) Optimal page replacement (5 marks)
- (ii) Least Recently Used (LRU) replacement with *stack and counter* implementation (5+5 marks)

- (b) Suppose that a disk drive has 200 cylinders, numbered 0 to 199. The drive is currently serving a request at cylinder 80. The queue of pending requests in first-in-first-out (FIFO) order is:

140, 113, 89, 52, 99, 114, 150, 178

Based on the disk scheduling policies below, list the order of the requests to be served and draw the scheduling order diagram. Calculate the total head movements.

- (i) First-come, first-served (FCFS) (5 marks)
- (ii) Shortest-seek-time-first (SSTF) (5 marks)
- [Total: 25 marks]

AACS5264(A) OPERATING SYSTEMS AND ADMINISTRATION

- Q4. (a) Write Linux command(s) to complete the following administrative tasks:
- (i) Create a directory named */jobs/projectZ*. Add two new groups called “*computer*” and “*science*” with the GID 5000 and 6000 respectively. Update the group “*computer*” with new GID 7000. (4 marks)
- (ii) Under the main hard disk, “*/dev/sda*”, create a new primary partition called “*/dev/sda3*” with the following requirements: (3 marks)
- file system is *ext3*
 - mount it to */jobs/projectZ* directory
- (iii) Add a regular user account with the following requirements: (5 marks)
- the user name is *alice*
 - the user ID (UID) is *8888*
 - the primary group is “*computer*”
 - the secondary group is “*science*”
 - the home directory for such user is located under “*/jobs/projectZ*”
- (iv) Create a directory named */home/testing* (4 marks)
- the owner of this directory is user named “*root*”
 - the directory belongs to the group “*science*”
 - the group “*science*” and the owner have read and write access to this directory, no access at all for other users
- (b) A critical section problem is a condition that accesses a shared resource (data structure or device) concurrently by more than one thread of execution. This will create race condition. Explain the three requirements for a solution to the critical-section problem. (3×3 marks)
- [Total: 25 marks]