ALLAMA IQBAL OPEN UNIVERSITY, ISLAMABAD

(Department of Computer Science)

WARNING

1. **PLAGIARISM OR HIRING OF GHOST WRITER(S) FOR SOLVING THE ASSIGNMENT(S) WILL DEBAR THE STUDENT FROM AWARD OF DEGREE/CERTIFICATE, IF FOUND AT ANY STAGE.**
2. **SUBMITTING ASSIGNMENTS BORROWED OR STOLEN FROM OTHER(S) AS ONE'S OWN WILL BE PENALIZED AS DEFINED IN "AIOU PLAGIARISM POLICY".**

Course: Operating System (903) **Semester: Autumn, 2012**
Level: BS (CS) **Total Marks: 100**
Pass Marks: 50

ASSIGNMENT No. 1

(Units: 1–4)

Note: All questions are compulsory. Each question carries equal marks.

Q. 1 (a) Which of the following instructions should be allowed only in kernel mode?

i) Disable all interrupts
ii) Read the time-of-day clock
iii) Set the time-of-day clock
iv) Change the memory map

(b) What is a race condition? Explain the difference between busy waiting and blocking.

Q. 2 (a) Consider a memory system with a cache access time of 100ns and a memory access time of 1200ns. If the effective access time is 10% greater than the cache access time, what is the hit ratio H?

(b) Why is the shell not part of the operating system itself?

Q. 3 Consider the following set of processes with the arrival time and the length of the CPU burst time given in milliseconds:

Process	**P1**	**P2**	**P3**	**P4**	**P5**
Arrival Time	9	6	8	7	5
Burst Time	3	4	9	9	7

Which CPU scheduling algorithm listed below yields the shortest average turnaround time?

(a) FCFS (First-Come-First-Served)
(b) SJF (Shortest Job First; without preemption)
(c) SJF (Shortest Job First; with preemption)
(d) RR-1 (Round-Robin with a time quantum of 1 milliseconds)

Please show all your work for full marks.

Q. 4 A process contains 5 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	4	4	1	0	1	2	0	3	0	4

(a) Show the successive pages residing in the four frames using the LRU replacement policy. Assume that the frames are initially empty. Compute the HIT ratio for LRU in the main memory.

(b) Repeat Part (a) for the FIFO replacement policy. Compute the HIT ratio for FIFO in the main memory.

Q. 5 Define and explain the following allocation algorithms:

(a) First-Fit
(b) Best-Fit
(c) Worst-Fit

ASSIGNMENT No. 2

(Units: 5–8) **Total Marks: 100**
Pass Marks: 50

Note: All questions are compulsory and carries equal marks.

Q. 1 (a) The clock interrupt handler on a certain computer requires 2 msec (including process switching overhead) per clock tick. The clock runs at 60 Hz. What fraction of the CPU is devoted to the clock?

(b) Why are output files for the printer normally spooled on a disk before being printed, instead of being directly from the application program?

Q. 2 Disk requests come in to the disk driver for cylinders 10, 22, 2, 40, 6 and 38, in that order. A seek takes 6 msec per cylinder moved. How much seek time is needed for

(a) First-come, first served
(b) Elevator algorithm (initially moving upwards)

In all cases, the arm is initially at cylinder 20.

Q. 3 (a) Draw a resource allocation graph (also called a reusable resource graph) that represents a deadlock state. Your graph must contain at least two resources and at least two tasks. Each resource must contain 3 units.

(b) Of course when execution started there were no arcs in the resource allocation graph. Give a scenario starting from this initial condition of no arcs and ending in the graph you gave for part (a). That is, tell what requests and releases occur and in what order. For this part you should assume a naïve (i.e., optimistic) resource manager that grants every request as soon as it can.

Q. 4 (a) To what hardware concept is a signal closely related? Give two examples of how signals are used.

(b) Give two examples of the advantages of relative pathnames over absolute ones.

Q. 5 A process with transaction timestamp 50 needs a resource held by a process with transaction timestamp 100. What happens in the following?
(a) Wait-die
(b) Wound-wait

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903 Operating Systems Credit Hours: 4 (4+0)

Recommended Book:
Modern Operating System 3rd Edition by Andrew S. Tanenbaum

Course Outlines:

Unit No. 1 Introduction
What is an Operating System, History of Operating System, Operating System Concepts, Operating System Structure

Unit No. 2 Process
Introduction to Processes, Inter-Process Communication, Classic IPC Problems, Process Scheduling

Unit No. 3 Memory Management
Memory Management without Swapping or Paging, Swapping, Virtual Memory, Page Replacement Algorithms

Unit No. 4 File Systems
Files, Directories, Files System Implementation, Security, Protection Mechanisms

Unit No. 5 Input/Output
Principles of I/O Hardware, Principles of I/O Software, Disks, Clocks, Terminals

Unit No. 6 Deadlock
Resources, Deadlocks, Deadlock Detection, Deadlock Recovery, Deadlock Avoidance, Deadlock Prevention, Other Issues

Unit No. 7 An Overview of Major Operating Systems
O/S2, UNIX, NT, Os/400, Windows

Unit No. 8 Distributed Operating Systems
Network Operating System, Distributed Operating System

Unit No. 9 Case Studies
UNIX, NT, Windows