The Open University of Sri Lanka
B.Sc. Degree Programme: LEVEL 05
Department of Mathematics and Computer Science
Final Examination 2011/2012
CPU3242 – OPERATING SYSTEMS
DURATION: Three Hours (3 hours)

Date: 20/12/2011 **Time: 1.00pm – 4.00 pm**

Answer **FOUR** Questions **Only**

QUESTION 1

1.1) Compare *a batch operating system* and *a timesharing system.*

1.2) What is meant by a *system call* in the context of an operating system?

1.3) List the **five** (5) operations that are involved in the creation of a process.

1.4) List **four** (4) conditions that may lead to the termination of a process.

1.5) Draw the state transition diagram of a process which is at the head of the queue. Briefly describe each process state.

1.6) Explain the functionality of the *process descriptor*? Give **five** (5) types of information that may be included in a process descriptor.

QUESTION 2

2.1) What is meant by *multiprogramming* in an Operating System?

2.2) Describe **four** (4) factors affecting the scheduling decisions of a process.

2.3) Compare *pre-emptive scheduling* and *non-preemptive scheduling.*

2.4) Consider a system with one CPU and four jobs, Each job has arrival time, burst time and priority as given below. *Priority* is ranked as 0 (lowest) and 127 (highest).

Job	Arrival Time	Burst Time	Priority
1	0	6	60
2	3	8	70
3	10	7	80
4	9	3	127

(i) Draw a Gantt chart illustrating the jobs and compute the average waiting time using the non pre-emptive SJF scheduling algorithm. Show the calculations.

(ii) Draw a Gantt chart illustrating the jobs and compute the average waiting time using the pre-emptive priority scheduling algorithm. Show the calculations.

(iii) Compute the average waiting times for Round Robin (RR) scheduling algorithm with time quanta of 4, 6, 8 units.

(iv) Predict the behavior of the RR scheduling algorithm as the length of time quantum approaches infinity?

QUESTION 3

3.1) Define *critical section problem* in the context of concurrent processes?

3.2) Propose a *hardware solution* and a *software solution* to achieve mutual exclusion in an operating system.

3.3) Explain **two** (2) methods of indirect communication; give a real world application for indirect communication.

3.4) Write an algorithm (c like code) to solve the *Dining philosopher problem* using semaphores.

QUESTION 4

4.1) Explain the terms *thread, thread yield* and *thread join* in the context of an operating system.

4.2) Explain the **three** (3) types of threading models used in an operating system using suitable diagrams.

4.3) Give the main difference between the buddy system memory allocator and the lazy buddy memory allocator?

4.4) Assume that the operating system on your computer uses buddy system for memory management. Initially the system has 1024Kb of memory, which begins at address 0. Show the result of each request/release given below via successive figures.

A: Request 70K
B: Request 35K
C: Request 80K
Release A
D: Request 60K
Release B
Release D
Release C

4.5) Assuming that the system given in 4.4 has only completed up to the memory request of C, Compute the amount of internal fragmentation that exists in the system at that time.

QUESTION 5

5.1) List **four** (4) sufficient and necessary conditions that are required for a dead lock to occur.

5.2) List the **two** (2) methods of handling a deadlock?

5.3) Explain *Dijkstra's Banker's Algorithm* using an appropriate example.

5.4) In a system, there are a total of 15 units of resource R1 and 7 units of resource R2. The system is in the following state (S0).

Process	Max		Allocation	
	R1	R2	R1	R2
P0	4	2	2	2
P1	5	7	4	1
P2	4	6	3	1
P3	6	4	3	2

(i) Show that the above state (S0) is a safe state. Give the complete sequence of jobs.

(ii) The process P2 requests for the resources (R1,R2) equivalent to units (2,0) when the system is in state S0. Is it possible to grant the request by P2? Give process sequence.

QUESTION 6

6.1) What is the difference between a *page* and a *page frame* ?

6.2) Consider the following page reference string. Assume no preparing occurs and three frames are allocated to process. Use the FIFO page replacement algorithm.

0,1,7,0,1,2,0,1,2,3,2,7,0,3,1,0,3

(i) Show what pages are in memory at each given time.
(ii) How many page faults would occur?

6.3) In a UNIX system *priya.txt* file is said to have the following permissions : (-rwxrw-r--),
Explain what is meant by those permissions.

6.4) Describe functionality of following disk access scheduling schemes

(i) SCAN
(ii) C-LOOK
(iii) SSTF