The Open University of Sri Lanka
B.Sc. Degree Programme: LEVEL 05
Department of Mathematics and Computer Science
Final Examination 2013/2014
CPU3242 – OPERATING SYSTEMS
DURATION: Three Hours (3 hours)

Date: 05/06/2014 **Time: 1.00pm – 4.00 pm**

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

QUESTION 1

1.1) List **three (3)** objectives of an operating system.

1.2) What are the tasks that are handled by an operating system kernel ?

1.3) Compare a batch operating system and a real time system.

1.4) Compare *multilevel queue* and *multilevel feedback queue* in the context of Operating system scheduling.

1.5) Explain the tasks of the following Operating system components.

(i) Main Memory management

(ii) File Management

QUESTION 2

2.1) What is meant by *the protection system* in an Operating System?

2.2) List **five (5)** fields that are in the data structure of the *process descriptor*.

2.3) What are the factors affecting scheduling decisions ?

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

Job	Arrival Time	Burst Time	Priority
1	0	10	70
2	2	3	70
3	7	6	80
4	10	1	100

(i) Draw a Gantt chart illustrating the jobs and compute the average waiting time using the FCFS scheduling algorithm (without priority). Show the calculations.

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

(iii) Compute the average waiting times for Round Robin (RR) scheduling algorithm with time quanta of 3, 6 units.

(iv) Calculate the total number of context switches in system for each of the above round robin time quanta stated in (iii) above.

QUESTION 3

3.1) What is *mutual exclusion* in the context of concurrent processes?

3.2) List a scheme to achieve mutual exclusion in an operating system.

3.3) Explain the characteristics of the following message passing primitives.

(i) Blocking vs Non-Blocking

(ii) Buffered vs Un-buffered

3.4) Write an algorithm (pseudocode) to solve the *bounded buffer problem.*

QUESTION 4

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

4.2) Suppose there are 2 arrays of which each array is having n elements. if you have 2n number of threads, how many comparisons are required to have the above 2 arrays merged ?

4.3) What is memory Coalescing?

4.4) Assume that the operating system on your computer uses the buddy system for memory management. Initially, the system has 2048Kb of memory, which begins at address 0. Show the result of each request/release given below via successive figures.

A: Request 140K
B: Request 80K
C: Request 170K
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) Explain **two** (2) methods of handling a deadlock?

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

5.3) In a System, there are a total of 15 units of resource R1, 7 units of resource R2 and 10 units of resource R3. The system is in the following state (S0).

Process	Max			Allocation		
	R1	R2	R3	R1	R2	R3
P0	4	2	4	2	2	2
P1	5	7	7	4	1	3
P2	4	6	1	3	1	0
P3	6	4	4	3	2	3

(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,R3) equivalent to units (1,0,1) when the system is in state S0. Is it possible to grant the request by P2? Give the process sequence.

QUESTION 6

6.1) What is memory fragmentation ? Explain two types of memory fragmentation using appropriate examples.

6.2) Consider the following page reference string. Assume no pre-paging occurs and three frames are allocated to a process. Use the LFU page replacement algorithm.

2, 1, 3, 4, 2, 1, 3, 4, 2, 1, 3, 4, 5, 6, 7, 8

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

6.3) In a UNIX system *janaki.txt* file needs following permissions. World can read, group can read and modify, owner can do any activity. Write the permission of *janaki.txt* file using the 10 character standard Unix file permission notation.

6.4) Head movement request queue of a disk is given as 96, 166, 29, 101, 15, 118, 59, 64. The current head position is 45. Draw figures for the following disk scheduling algorithms depicting the head movement of a disk.

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