The Open University of Sri Lanka
B.Sc. Degree Programme: LEVEL 05
Department of Mathematics and Computer Science
Final Examination 2015/2016
CPU3242 – OPERATING SYSTEMS
DURATION: Three Hours (3 hours)

Date: 30/06/2016 **Time: 1.00pm – 4.00 pm**

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

QUESTION 1

1.1) What is a *kernel* in an operating system?

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

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

1.4) Draw an abstract diagram of system components involved in the interaction between a user and the hardware of a computer.

1.5) Draw the state transition diagram of a process which is newly admitted to the system and at the head of the queue. Briefly describe each process state.

QUESTION 2

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

2.2) Compare *waiting time* and *response time* in the CPU scheduling mechanism of an operating system.

2.3) Consider a system with one CPU and four jobs, Each job has arrival time and burst time as given below.

Job	Arrival Time	Burst Time
1	0	10
2	2	8
3	3	6
4	5	3
5	7	1

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

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

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

QUESTION 3

3.1) List **four** (4) major activities involved in the main memory management of an operating system

3.2) What is *race condition* in the context of concurrent processes?

3.3) List the set of conditions required to achieve the mutual exclusion in given set of processes.

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

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

QUESTION 4

4.1) Give **three** (3) advantages of using threads in an operating system.

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

4.3) What are the advantages and disadvantages of kernel level threads

4.4) Assume that the operating system on your computer uses 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 170KB
B: Request 85KB
C: Request 145KB
D: Request 75KB
Release A
Release B
Release C
Release D

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

QUESTION 5

5.1) Explain *first fit*, *next fit* and *worst fit* memory allocation schemes of a memory manager with a suitable example.

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

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	3	2	2	2
P1	4	7	4	4	1	2
P2	5	6	5	3	1	2
P3	6	4	1	3	2	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, R3) equivalent to units (2, 0, 1) 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) Draw a block diagram to illustrate address translation with two level paging

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

6.4) Describe functionality of following disk access scheduling schemes

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