EASTERN UNIVERSITY, SRI LANKA

DEPARTMENT OF MATHEMATICS

SECOND EXAMINATION IN SCIENCE –2012/2013

SECOND SEMESTER (APRIL / MAY, 2015)

CS 202 - OPERATING SYSTEMS

Answer all questions

Time allowed: 02 Hours

Q1).

a) Describe briefly the *context switching* and discuss the overheads involved in context switching of processes.

b) Explain the *round-robin scheduling algorithm* listing its advantages and disadvantages.

c) Consider the following set of processes, with the arrival times and the length of the CPU-burst times given in milliseconds.

Process	Burst time (ms)	Priority	Arrival time
P1	50	4	0
P2	20	1	20
P3	80	3	50
P4	40	2	60
P5	10	1	65

(i) Draw the Gantt chart for each of the following scheduling algorithms:

(α) *Round Robin Scheduling* (with time quantum = 20 ms.)

(β) *Priority Scheduling* (pre-emptive, smallest integer value represents the highest priority).

(ii) Calculate the *waiting time* and the *turnaround time* for each process using each of those scheduling algorithms in part (i). Also compute the average waiting time and average turnaround time for each of those algorithms.

Q2).

a) Discuss the problems of concurrent execution of processes.

b) State and explain what is meant by race condition with regard to resource sharing in multi-programming environment.

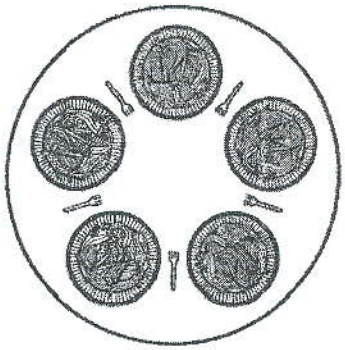
c) A semaphore is a process synchronization tool.

i. Describe the operations *P(s)* and *V(s)* on a semaphore 'S'.

ii. What do you understand by the *Dining Philosophers Problem* of proce synchronization?

iii. Consider the following scenario:

Five philosophers are seated around a circular table. Each philosopher has plate of spaghetti. The spaghetti is so slippery that a philosopher needs tw forks to eat it. Between each pair of plates is one fork. The layout of the table illustrated below.



The life of a philosopher consists of alternate periods of eating and thinking. When a philosopher gets hungry, he/she tries to acquire his/her left and right fork, one at a time, in either order. If successful in acquiring two forks, he/she eats for a while, then puts down the forks, and continues to think. Explain briefly how semaphores could be used to solve the Dining Philosophers Problem.

Q3).

a) What is defined by a *deadlock*?

b) Discuss the necessary conditions for a deadlock.

c) Consider the snapshot of system operation described below:

The system has five processes namely, P0, P1, P2 P3 & P4 and four resource types namely A, B C & D. The system has eight instances of resource type A, five instances of resource type B, nine instances of resource type C and seven instances of resource type D.

Process	Allocation	Max	Need
	A B C D	A B C D	A B C D
P0	2 0 1 1	3 2 1 4	
P1	0 1 2 1	0 2 5 2	
P2	4 0 0 3	5 1 0 5	
P3	0 2 1 0	1 5 3 0	
P4	1 0 3 0	3 0 3 3	

Available
A B C D

Answer the following using *Banker's algorithm*.

(i) Fill the content of the table columns *Need* and *Available*.

(ii) Verify whether the system is in safe or unsafe state. If it is in safe state, give the safe sequence in which the processes could execute without causing a deadlock to the system.

(iii)Describe the system state if the following request come from the processes:

(α) If a request from process P3 arrives for additional resources of (0, 3, 2, 0), can the request be granted immediately? If yes give the safe sequence.

(β) If a request from process P2 arrives for additional resources of (1, 1, 0, 1), can the request be granted immediately? If yes give the safe sequence.

Q4).

a) What is *memory fragmentation*?

b) Compare the internal and external fragmentation by giving suitable example for each.

c) Explain the *first fit* and *best fit* memory allocation techniques.

d) The following table shows the job details and the list of memory blocks of the system:

Job List:

Job no	Memory requested (Kb)
J1	35
J2	25
J3	10
J4	50
J5	20
J6	45

Memory List:

Memory Location	Block Size (Kb)
100	30
200	50
300	40
400	50
500	20
600	25

You are requested to allocate the jobs in the memory and to find the memory fragmentation using first fit and best fit memory allocation methods.

e) Describe the *paged memory allocation scheme*. List two advantages and two disadvantages of the paged memory allocation scheme.