Beijing-Dublin International College

SEMESTER 1 FINAL EXAMINATION - (2019/2020)

School of Computer Science

COMP2012J and COMP2006J Operating Systems

Assoc. Prof. Chris Bleakley
External Examiner: Dr Rosemary Monahan
Dr. Fatemeh Golpayegani* and Dr. Vivek Nallur*

Time Allowed: 120 minutes

Instructions for Candidates:

Answer succinctly and to the point

BJUT Student ID:_____ **UCD Student ID:**_____

I have read and clearly understand the Examination Rules of both Beijing University of Technology and University College Dublin. I am aware of the Punishment for Violating the Rules of Beijing University of Technology and/or University College Dublin. I hereby promise to abide by the relevant rules and regulations by not giving or receiving any help during the exam. If caught violating the rules, I accept the punishment thereof.

Honesty Pledge:_____ **(Signature)**

Instructions for Invigilators

No rough-work paper is to be provided for candidates.

1. What is a *real-time Operating System*? Name two applications that it is used for? **(4)**

real-time: to guarantee a response to physical event in a fixed interval of time. Sunway System, flight control

2. Explain the difference between user-mode and kernel-mode operations? What is the advantage of having dual mode operation? **(5)**

kernel-mode: access to all CPU instryction set. User-mode: access restricted to a subset of the instruction set. Using the privated instruction to prevent faulty user program affecting whole the system.

3. Answer the following questions about the processes:

   (a) What is the main difference between a *program* and a *process*?

   (b) What is a Process Control Block? Describe at least **six** pieces of information that it contains.

   (c) What is a context swtich?

a. proccess is is a program in execution. b. PCB is data structure used by OS to store information about running processes. PID, process state, program counter, accounting information, CPU register,process number. c. context swich save and load the state of process using the information in PCB. It allows process swiched easily. **(15)**

4. Answer the following questions about deadlock and starvation:

   (a) Define deadlock and name **two** methods that prevent deadlock.

   (b) Describe the Bankers Algorithm.

   Consider a system with five processes P0 to P4 and three resources of type A,B, C. Resource A has 10 instances, B has 5 instances and C has 7 instances. Suppose at t0 following snapshop of the system has been taken. (a) what is the need Matrix? (b) Is the following system in a safe state? (c) if so what is the safe sequence of processes?

Process	Allocation	Max	Available
	A B C	A B C	A B C
P_0	0 1 0	7 5 3	3 3 2
P_1	2 0 0	3 2 2	
P_2	3 0 2	9 0 2	
P_3	2 1 1	2 2 2	
P_4	0 0 2	4 3 3	

a. a set of proccess is in deadlock when every proccess is blocked forevry to wait for the availability of resources held by other resource. At same time no one could release the resources they held. Message, semaphores and monitors.

(20)

5. Answer the following questions about Process Scheduling:

   (a) Define Preemptive Scheduling and name **two** of its benefits.

   (b) Describe the following scheduling algorithms:

   - Round Robin (quantum = 2)
   - First Come First Served

Preemptive scheduling is when a process is forced to leave processor is is running in, in order to give another process. stop the fault or malicious, guarantee to finish the urgency process. b. processes are dispatched by FIFO but only given a 2 quantum. First come First served means dispatched the process follow the FIFO

(c) Calculate the average waiting time when you use each of the above mentioned algorithms for the situation described in the following table:

	P_1	P_2	P_3
Arrival Time	0	2	4
Burst Time	7	4	1

RR: 8/3
FCFS: 4

(10)

6. Consider a primary memory with four frames, how many page faults will occur with the following page replacement algorithms and corresponding reference strings:

   (a) `76131724152323364240` — *Optimal Replacement Policy*

   (b) `6613152000243607` — *Least Recently Used Policy*

   Assume that in each case, the four frames are initially empty. Show your working for each policy. **(10)**

7. What is meant by *protection* in operating systems? Describe two basic goals of protection. Also, give **two** basic principles used while implementing protection mechanisms. **(8)**

Protection involves controlling the access of programs, processes, or user to the resources. Preventing malicious/ intentional violation of access. Ensuring consistency with OS policies. Only allow to access the resources which it has authority. Only allow to access the resources currently needed to complete the task.

8. List the responsibilities of a filesystem. Describe two ways of structuring directories in a filesystem. Give an advantage and disadvantage of each. **(8)**

File management, sharing and security, file integrity mechanism, access methods.
Single -level: all files are stored in a direction. It is simple, but they find file in linear search lead to lower performance.
Hierarchical: root directory as begin is stored in device. It need more storage, but faster and easier to manage.

Total marks for the paper: 80