Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2018/2019

COURSE NAME	:	OPERATING SYSTEM
COURSE CODE	:	BNF 32303
PROGRAMME CODE	:	BNF
EXAMINATION DATE	:	DECEMBER 2018 / JANUARY 2019
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTION	:	i) ANSWER **ALL** QUESTIONS IN **SECTION A** ii) ANSWER **ONE (1)** QUESTION IN **SECTION B**

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

SECTION A

Q1 (a) Discuss all **FOUR (4)** of the basic computer system components

(8 marks)

(b) A boot sequence is the set of operations a computer system performs at startup.

(i) The computer system run an initial program during the boot sequence. State the name of the initial program.
(ii) Explain the actions in typical boot sequence.

(4 marks)

(c) Operating System user interface provides simplified access to a computer system.

(i) List **TWO (2)** types of user interface.
(ii) Provide **THREE (3)** main differences between the two types of user interface listed in **Q1(c)(i)** above.

(8 marks)

(d) A user program intend to open a file using a system-call '`open()`'. Draw a diagram to demonstrate the implementation of this system-call. Include 'user mode', 'kernel mode' and 'system-call interface' in your diagram.

(5 marks)

Q2 (a) State the difference between a 'program' and a 'process'

(2 marks)

(b) In process creation, a parent process creates child processes and in turn create their own child processes.

(i) For UNIX system, name the system-call used to 'create' and 'terminate' a process.
(ii) Draw a diagram of a parent process that creates **TWO (2)** child processes and each of the child processes creates a child process of its own. Label a suitable process identifier (PID) for every process.

(8 marks)

(c) Inter-process comunication (IPC) allows cooperation among processes.

(i) Identify **THREE (3)** reasons why processes need to cooperate.
(ii) Shared Memory and Message Passing are two models of IPC. Explain **ONE(1)** benefit for each of the models.

(7 marks)

(d) Thread is the fundamental unit of CPU utilization.

(i) Identify **THREE (3)** key differences between Process and Thread.
(ii) Define multithreading and explain how multithreading is better than single processing.

(8 marks)

Q3 (a) Deadlock can occur when a set of blocked processes each holding a resource and waiting to acquire a resource held by another process in the set.

(i) List **TWO (2)** examples of deadlock that are analogous to computer-system environment.
(ii) Provide **FOUR (4)** necessary conditions for deadlock to occur.

(8 marks)

(b) Draw the resource allocation graph based on resource usage in **Table Q3(b).**

(7 marks)

(c) Given the system model:

Processes, $P = \{P_1, P_2\}$
Resources, $R = \{R_1, R_2\}$
Resource instances, $W_1 = 2, W_2 = 2$
Edges, $E = \{P_1 \rightarrow R_2, P_2 \rightarrow R_2, P_2 \rightarrow R_1, R_1 \rightarrow P_1, R_1 \rightarrow P_2, R_2 \rightarrow P_2\}$

(i) Draw the corresponding resource allocation graph based on the system model.
(ii) Determine whether the resource allocation graph in (i) is in deadlock or not.
(iii) Determine the condition if P_2 request for R_2 is granted.

(10 marks)

SECTION B

Q4 (a) Scheduling algorithms in CPU scheduling deals with the problem of deciding which of the processes in the ready queue to be allocated the CPU. Explain briefly:

(i) FCFS scheduling
(ii) SJF scheduling
(iii) RR scheduling
(iv) Waiting time
(v) Time quantum

(5 marks)

(b) **Table Q4(b)** shows the set of processes with the length of the CPU-burst time given in milliseconds. The processes are assumed to have arrived in the order P1, P2, P3, P4, and P5 all at time 0.

(i) Draw **FOUR (4)** Gantt charts illustrating the execution of these processes using FCFS, SJF, Priority (where smaller priority number implies a higher priority), and RR (given, time quantum is 5ms) scheduling.
(ii) Evaluate the waiting time of each process for FCFS and SJF scheduling algorithms in (i) respectively.
(iii) Between FCFS and SJF, which of the scheduling algorithm in part (ii) has the lower average waiting time (over all processes)?

(20 marks)

Q5 (a) Describe **TWO (2)** differences between Logical Address and Physical Address.

(4 marks)

(b) Given process P1, P2, P3 and P4 are requesting memory of 10kB, 30kB, 20kB and 10kB respectively. Original memory partition are given in **Table Q5(b)**. Illustrate the new memory partition after inserting the process by using:

(i) First fit algorithm
(ii) Best fit algorithm

(10 marks)

(c) Given the Unix Tree Structured Directories in **Figure Q5(c)**. Answer the following questions. Let your initial location be `/home/UTHM`.

(i) State Unix command to display your current location.
(ii) State the Unix command to list all directories in long listing format
(iii) Code the Unix command to change your location into `eBook` directory.
(iv) Code a single Unix command to delete all text file in `Document` directory
(v) Code a simple Bash Script that can execute the following operation. First enter `Exam` directory, then create a text file named `thereisnocake.txt`, and finally displays all the files in the current directory.

(11 marks)

- **END OF QUESTIONS** -

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Table Q3(b)

Process	Current Allocation			Outstanding Request			Available Resouces		
	R1	R2	R3	R1	R2	R3	R1	R2	R3
P1	1	0	0	1	1	0	0	0	1
P2	2	1	0	0	0	0			
P3	1	2	1	0	0	1			
P4	0	1	0	0	1	0			

Table Q4(b): Process queue

Process	Burst Time (ms)	Priority
P1	10	3
P2	1	1
P3	2	3
P4	1	4
P5	5	2

Table Q5(b)

30 kB
15 kB
50 kB
20 kB

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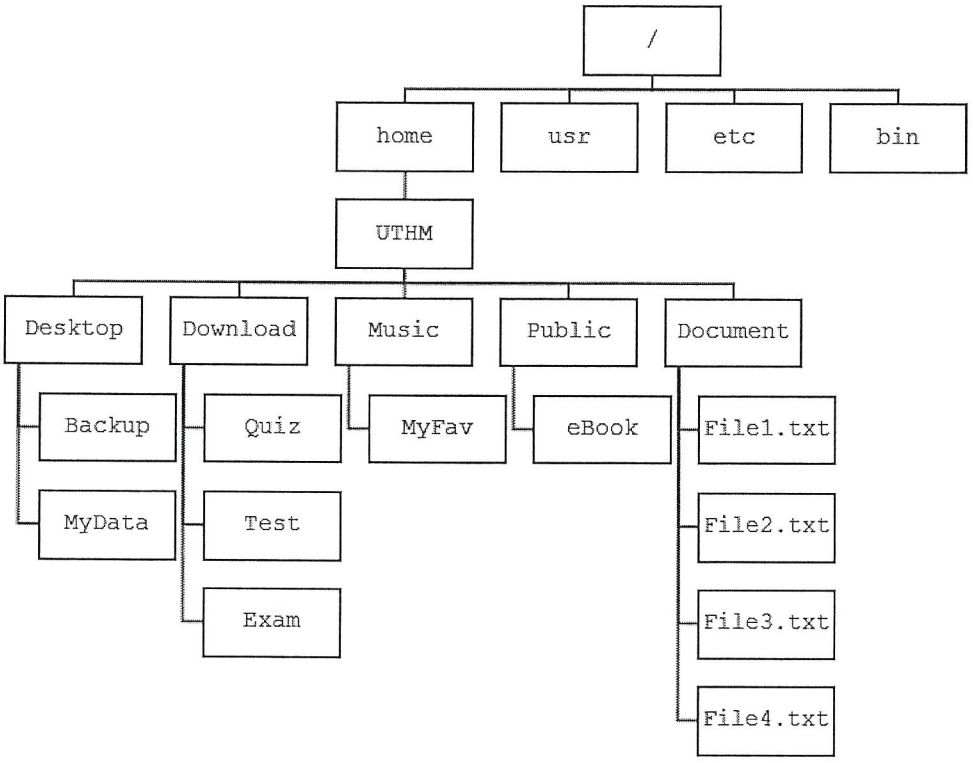

Figure Q5(c)