UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2022/2023

COURSE NAME	:	OPERATING SYSTEMS
COURSE CODE	:	BEJ 32202
PROGRAMME CODE	:	BEJ
EXAMINATION DATE	:	FEBRUARY 2023
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWER ALL QUESTIONS 2.THIS FINAL EXAMINATION IS CONDUCTED VIA CLOSED BOOK. 3.STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

Q1 (a) A process is basically a program in execution. The execution of a process must progress in a sequential state. Illustrates the diagram of a process changing state as it executes.

(5 marks)

(b) Draw **three (3)** multithreading models for the user and kernel threads.

(6 marks)

(c) Describe the concept of context switch in OS process management.

(4 marks)

Q2 Consider the following set of processes in **Table Q2(a)**, with the estimated CPU burst given in milliseconds, and lower priority numbers corresponding to higher CPU priority (1 is the highest). The processes are assumed to have arrived in the order of P1and P2, P3, P4, P5, all at time 0.

Table Q2(a)

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

(a) Produce **three (3)** Gantt charts that illustrate the execution of these processes in **Table Q2(a)** using the following scheduling algorithms:

(i) non-preemptive (NP) shortest job first (SJF)
(ii) non-preemptive priority
(iii) round robin (RR) with quantum=1

(7 marks)

(b) Based on **Table Q2(b), c**alculate the waiting time for each process based on the scheduling algorithm.

Table Q2(b)

	Waiting Time		
Process	NP SJF	NP PRIORITY	RR (Q=1)
P1			
P2			
P3			
P4			
P5			

(10 marks)

(c) Conclude the results in **Q2(b)**.

(3 marks)

Q3 (a) Describe the "Producer-Consumer Problem".

(5 marks)

(b) Analyse the similarities and differences between the "Producer-Consumer Problem" and the "Readers-Writers Problem".

(4 marks)

(c) Explain **three (3)** requirements to solve the Critical Section Problem

(6 marks)

Q4 (a) State **three (3)** conditions that must be fulfilled for a deadlock to occur.

(3 marks)

(b) Determine whether the following resource allocation graphs in **Figure Q4(a) – Q4(d)** is a deadlock condition or not:

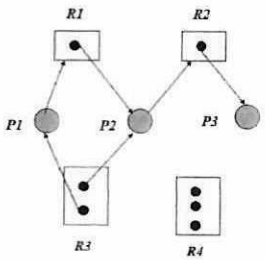

Figure Q4(a)

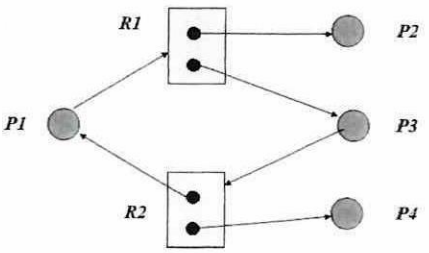

Figure Q4(b)

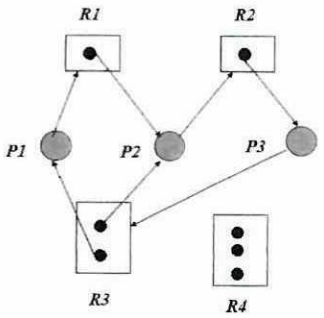

Figure Q4(c)

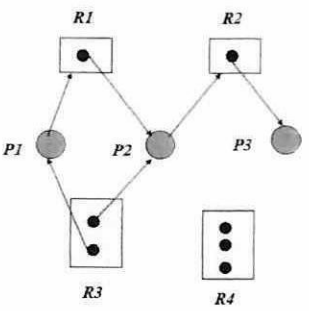

Figure Q4(d)

(8 marks)

(c) Explain **two (2)** strategies for handling deadlocks.

(4 marks)

Q5 (a) Discuss **two (2)** differences between logical and physical addresses.

(4 marks)

(b) Produce **two (2)** examples of why it is important to consider the skill and resources available to likely intruders, when designing computer security mechanisms and policies to defend against those intruders.

(4 marks)

(c) Consider the following page reference string:

0,1,4,2,0, 2,6,5,1,2, 3,2,1,2,6, 2,1,3,6,2.

Calculate the page faults that will occur if the program has **three (3)** page frames available to it and uses the following algorithm:

(i) FIFO (First In First Out) replacement
(ii) LRU (Least Recently Used) replacement

(7 marks)

Q6 (a) There are **two (2)** approaches to handle errors for bad sectors. Briefly explain how to deal with the bad sectors for each approach.

(4 marks)

(b) On a disk with 1000 cylinders numbers 0 to 999, it takes 1 ms to travel from one track to the next adjacent one. While retrieving data from track 150, the following list of requests has arrived: -

Track Number: 110, 90, 5, 101, 305, 70, 14.

By using the following device handler seek strategies:

i. FCFS (First Come First Serve)/ FIFO (First In First Out)
ii. SSTF (Shortest Service Time Request)
iii. SCAN
iv. LOOK

Compute the number of tracks and the average number of tracks on the disk arm must move to satisfy the requests in the disk queue. Show your work for each strategy.

(12 marks)

(c) In a storage system with conventional magnetic-media disks, several different delays occur when servicing a request. Identify at least **two (2)** of these delays, and comment on their relative contribution to the total delay for servicing a request.

(4 marks)

– END OF QUESTIONS –