UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2012/2013

COURSE NAME	:	OPERATING SYSTEMS
COURSE CODE	:	BIT 20403
PROGRAMME	:	2 BIT
EXAMINATION DATE	:	JUNE 2013
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

Q1   (a)   State the location of a virtual memory.

(1 mark)

(b)   Propose the best solution when a user gets an error message on low virtual memory.

(2 marks)

(c)   Justify why increasing size of virtual memory is not recommended based on situation in **Q1 (b)**.

(2 marks)

(d)   Determine the exact address for frame 2 if the starting address of frame 1, the 4KB page in primary memory is 1024.

(2 marks)

Q2   (a)   Identify the **TWO (2)** decisions that operating system has to define when there is a trap of page fault.

(2 marks)

(b)   Presume that process P1 wants to transfer 256 KB of data from the disk to the memory. If the system provides a buffer of 32 KB, find the number of interrupts received by the CPU from the DMA in completing the transfer.

(2 marks)

(c)   Assume that there are five processes in the system (running or ready to run). If round robin scheduling algorithm with time quantum of 8 ms is used, calculate the time taken for the waiting process.

(2 marks)

Q3   Based on process execution in **Table 1**,

Table 1: Process Execution

Process	Arrival Time	Processing Time
P_1	0.000	3
P_2	2.001	6
P_3	2.001	5
P_4	3.002	2
P_5	4.001	3

(a)   Outline Gantt chart to illustrate the processes execution using:

(i)   First Come First Served
(ii)   Shortest Job First (Non-Preemptive)
(iii)   Shortest Remaining Time (Preemptive)
(iv)   Round Robin (time quantum = 2)

(16 marks)

(b)   Analyze the Gantt chart of **Q3 (a)**. Calculate the average waiting time for all scheduling algorithms listed in **Q3 (a)**.

(8 marks)

(c)   Analyze the Gantt chart of **Q3 (a)**. Calculate the average turnaround time for all scheduling algorithms listed in **Q3 (a)**.

(8 marks)

(d)   Give the meaning of starvation problem in priority scheduling.

(1 mark)

(e)   What is the solution of starvation problem in priority scheduling?

(1 mark)

Q4   Based on the process resource usage and availability as depicted in **Table 2** below.

Table 2: Process Resource Usage and Availability

Process	Current Allocation			Outstanding Requests			Resources Available		
	R_1	R_2	R_3	R_1	R_2	R_3	R_1	R_2	R_3
P_1	0	1	1	0	1	0			
P_2	1	3	0	0	0	1			
P_3	3	1	0	0	0	0	0	0	0
P_4	2	0	0	1	1	0			

(a)   outline the resource allocation graph.

(6 marks)

(b)   outline the reduced resource allocation graph in sequence.

(4 marks)

(c)   Use your answer of **Q4 (b)** to justify whether the system is deadlock. Why?

(2 marks)

Q5   (a)   Based on **FIGURE Q5 (a)**, analyze it and fill up the **Table 3** process resource usage and availability.
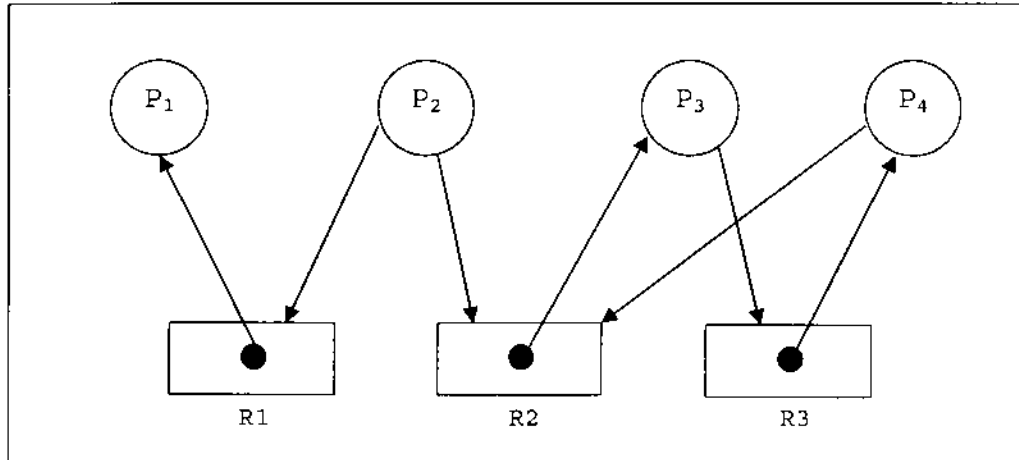
(6 marks)
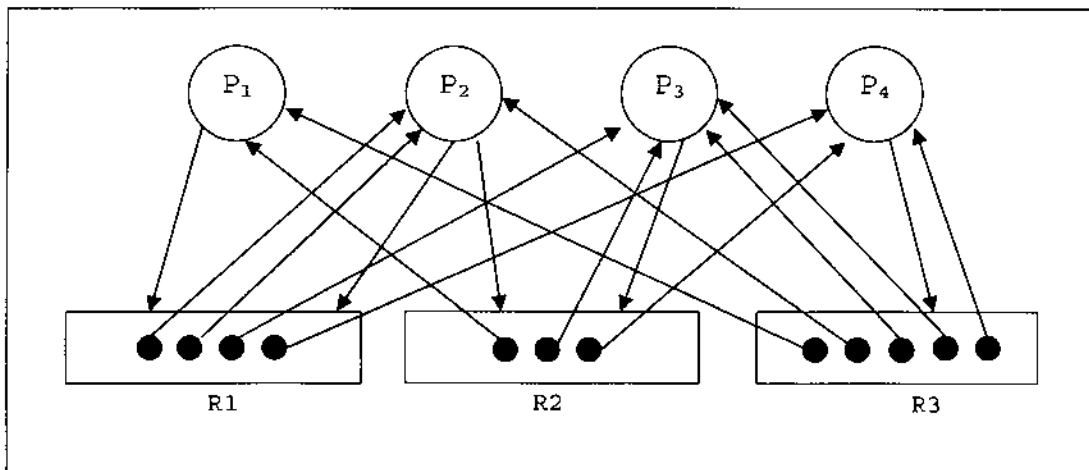
FIGURE Q5 (a)

Table 3: Process Resource Usage and Availability

Process	Current Allocation			Outstanding Requests			Resources Available		
	R_1	R_2	R_3	R_1	R_2	R_3	R_1	R_2	R_3
P_1									
P_2									
P_3									
P_4									

(b)   Based on **FIGURE Q5 (b)**, illustrate

FIGURE Q5 (b)

(i)   reduced resource allocation graph

(2 marks)

(ii)   wait for graph

(2 marks)

(c)   Use your answer of **Q5 (b) (i)** and **Q5 (b) (ii)** to justify whether the system is deadlock. Why?

(3 marks)

Q6   Based on the given information, answer the following questions.

        Process size   =   890 K
        Frame size   =   45 K
        Memory size   =   200 K
        Address Reference =   17, 311, 78, 50, 123, 67, 170, 38,
                                 78, 221, 56, 27, 168, 90, 234, 133,
                                 66, 212, 120

   (a) Calculate the reference string.

                                                                    (2 marks)

   (b) Compute the number of pages required by the above process.

                                                                    (2 marks)

   (c) Calculate the number of frames required by the above process.

                                                                    (2 marks)

   (d) Outline the number of page faults produced by the following algorithms towards the
        reference string as calculated in **Q6 (a)**.

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

                                                                    (9 marks)

Q7   The following **Table 4** indicates page, load time and last reference time.

Table 4: Page Load and Reference Time

Page	Load Time	Last Reference Time
0	167	374
1	321	321
2	150	306
3	154	300

   (a) Analyze which page will FIFO replace?

                                                                    (2 marks)

   (b) Analyze which page will LRU replace?

                                                                    (2 marks)

Q8   Given references to the following pages by a program:

3, 8, 3, 2, 8, 7, 2, 8, 2, 1, 7, 8, 7, 8, 1, 8, 1, 0, 9, 0

Outline the number of page faults produced by the following algorithms if the program has three page frames available.

(a)   FIFO

(3 marks)

(b)   LRU

(3 marks)

(c)   Optimal

(3 marks)

- **END OF QUESTION** –