GRIFFITH COLLEGE Dublin

BACHELOR OF SCIENCE IN COMPUTING

Class Test

OPERATING SYSTEMS DESIGN

Lecturer: **Dr Faheem Bukhatwa**

Date: April 18th 2018 **Time:**

This is a 75 minute test

ALL QUESTIONS TO BE ATTEMPTED.

ALL QUESTIONS CARRY EQUAL MARKS.

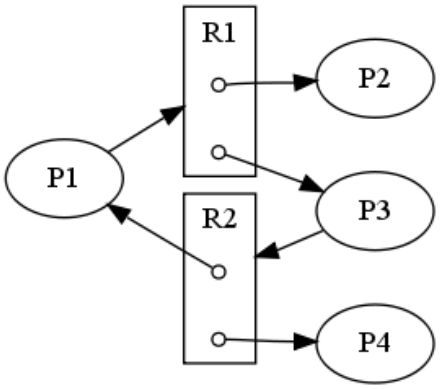
Q1) In demand paged memory system, a program requests pages in the following order:

e c a b a d e a c d b a e

Construct a **page trace analysis** indicating page faults with an asterisk (*****) using the **Least recently used (LRU)** policy where 4 page frames were allocated to the program in main memory.

(10 marks)

Q2) Apply the Directed Resource Graphs to detect the presence of a deadlock in the system of processes and resources outlined in the figure below. Write each step involved.



(10 marks)

Q3) i) With reference to memory management explain Page thrashing. .

(4 marks)

ii) Describe Batch operating systems, Real-time operating systems and Embedded processing operating systems.

(6 marks)

Q4) With regard to fixed and dynamic partitions memory management:

i) Explain the best-fit and the worst-fit algorithms

(5 marks)

ii) Consider the following table is the free list of partitions in a dynamic partitioning memory allocation scheme. Illustrate where each of the algorithms (best-fit and the worst-fit) would place arriving processes of 20K, 10K and 5K (in that order)

Memory Block Size	Status
10K	Free
30K	Free
5K	Free
20K	Free
15K	Free
20K	Free

(5 marks)

Q5) Consider a number of processes submitted in the following order. They are identified as taking 50, 25, 15, 10 and 240 seconds respectively. Show how to calculate the average turnaround time for FCFS Scheduling?

(10 marks)

Q1) In demand paged memory system, a program requests pages in the following order:

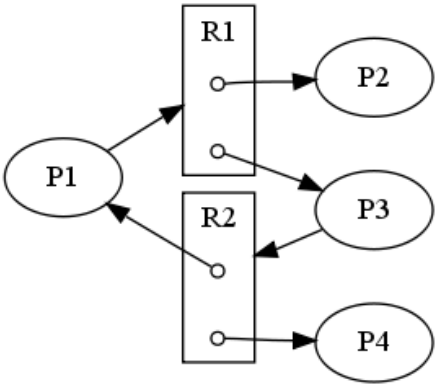
e c a b a d e a c d b a e

Construct a **page trace analysis** indicating page faults with an asterisk (*****) using the **Least recently used (LRU)** policy where 4 page frames were allocated to the program in main memory.

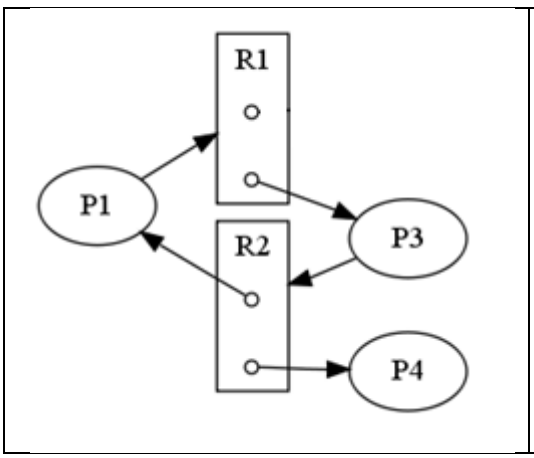
(10 marks)

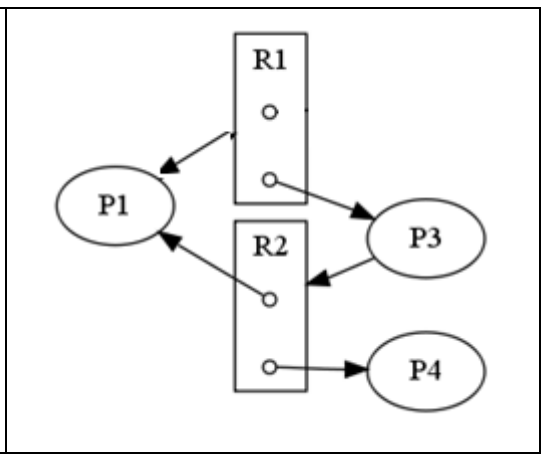
Page requests	E	C	A	B	A	D	E	A	C	D	B	A	E
Page frame 1	E	E	E	E	E	D	D	D	D	D	D	D	D
Page frame 2		**C**	**C**	**C**	**C**	**C**	**E**	**E**	**E**	**E**	**B**	**B**	**B**
Page frame 3			**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
Page frame 4				**B**	**B**	**B**	**B**	**B**	**C**	**C**	**C**	**C**	**E**
Page interrupts	*****	*****	*****	*****		*****	*****		*****		*****		*****
Time	**1**		**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

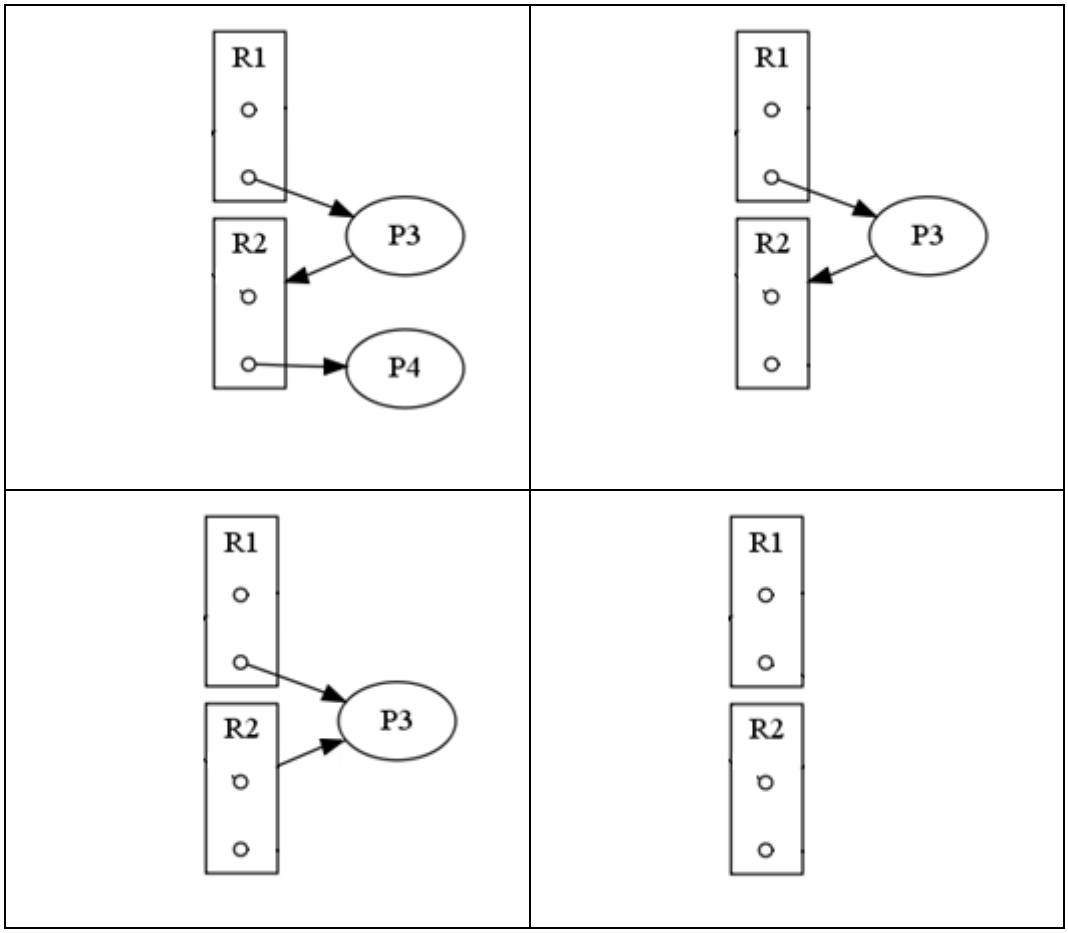
Q2) Apply the Directed Resource Graphs to detect the presence of a deadlock in the system of processes and resources outlined in the figure below. Write each step involved.



(10 marks)







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ii) Describe Batch operating systems, Real-time operating systems and Embedded processing operating systems.

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Q3) i) With reference to memory management explain Page thrashing. .

(4 marks)

Thrashing is frequent page faults.
A page fault is when a page is required but it is not in main memory.

This is a problem that happens in demand paged memory management systems.
It can be caused by page division happening in middle of loops in code, in conjunction with a bad page swapping strategies.

ii) Describe Batch operating systems, Real-time operating systems and Embedded processing operating systems.

(6 marks)

Explanations of the three systems 2 marks each

• Batch Systems:
– Collection of jobs done at a later time.
– No requirements for response time.
– Efficiency of the system was measured in throughput

• Real-time systems:
– Fastest and used in time-critical environments
– Real-time systems are used for:
• Space flights, airport traffic control, high-speed aircraft
• Industrial processes
• Sophisticated medical equipment
• Distribution of electricity
• Telephone switching
– A real-time system must be 100 percent responsive, 100 percent of the time

• Embedded Systems:
– Computers placed inside other products to add features and capabilities
– Operating systems with small kernel and flexible functions capabilities will have potential for embedded system

Q4) With regard to fixed and dynamic partitions memory management:

i) Explain the best-fit and the worst-fit algorithms

(5 marks)

- Best-Fit allocate from the smallest available block that is big enough. It searches the entire list unless the list is ordered by size. Produces the smallest leftover hole. It has a slow allocation but provides better use of memory. Many small external fragments are created.

- Worst-Fit – allocate from the largest available block. It searches the entire list unless the list is ordered by size. Produces the largest leftover hole with less external fragmentation. It is slow at allocation.

ii) Consider the following table is the free list of partitions in a dynamic partitioning memory allocation scheme. Illustrate where each of the algorithms (best-fit and the worst-fit) would place arriving processes of 20K, 10K and 5K (in that order)

Memory Block Size	Status
10K	Free
30K	Free
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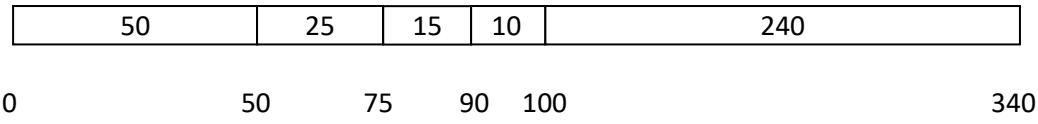
15K	Free
20K	Free

(5 marks)

Available free Blocks	**Best fit**		**Worst fit**	
	Memory blocks	**processes**	**Memory blocks**	**processes**
10K	10K	**10 K Pr 2**	10K	
30K	30K		30K	**20 K Pr 1**
5K	5K	**05 K Pr 3**	5K	
20K	20K	**20 K Pr 1**	20K	**10 K Pr 2**
15K	15K		15K	
20K	20K		20K	**05 K Pr 3**

Q5) Consider a number of processes submitted in the following order. They are identified as taking 50, 25, 15, 10 and 240 seconds respectively. Show how to calculate the average turnaround time for FCFS Scheduling?

(10 marks)



FCFS

0 50 75 90 100 340

Average turnaround time = (50 + 75 +90+100+340) / 5 = 655/5 = 131 seconds