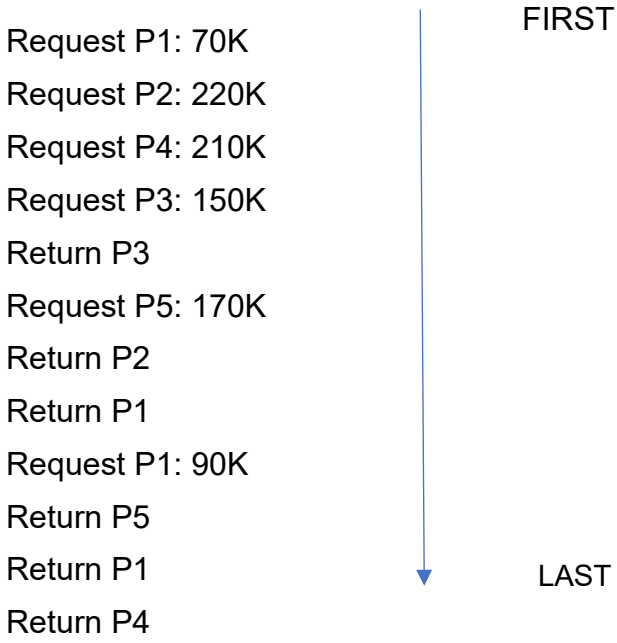
7SENG012W Software Development Environments
Practice In-Class Test questions #1

1. Assume that a computer system is equipped with 1024K memory starting at address 0. The memory is organized using the Buddy system. Initially all memory is free. Allocations and de-allocations are received as follows:



i. Show diagrammatically each of the steps including how allocations and de-allocations are carried out as well as the merger of blocks of memory.

<table>
<tr><td colspan="4">1024K</td></tr>
<tr><td colspan="3">512K</td><td colspan="2">512K</td></tr>
<tr><td colspan="2">256K</td><td>256K</td><td colspan="2">512K</td></tr>
<tr><td>128K</td><td>128K</td><td>256K</td><td colspan="2">512K</td></tr>
<tr><td>P1</td><td>128K</td><td>256K</td><td colspan="2">512K</td></tr>
<tr><td>P1</td><td>128K</td><td>P2</td><td colspan="2">512K</td></tr>
<tr><td>P1</td><td>128K</td><td>P2</td><td>256K</td><td>256K</td></tr>
<tr><td>P1</td><td>128K</td><td>P2</td><td>P4</td><td>256K</td></tr>
<tr><td>P1</td><td>128K</td><td>P2</td><td>P4</td><td>P3</td></tr>
<tr><td>P1</td><td>128K</td><td>P2</td><td>P4</td><td>256K</td></tr>
<tr><td>P1</td><td>128K</td><td>P2</td><td>P4</td><td>P5</td></tr>
<tr><td>P1</td><td>128K</td><td>256K</td><td>P4</td><td>P5</td></tr>
<tr><td>128K</td><td>128K</td><td>256K</td><td>P4</td><td>P5</td></tr>
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<tr><td colspan="3">512K</td><td>P4</td><td>P5</td></tr>
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<tr><td colspan="3">512K</td><td>256K</td><td>256K</td></tr>
<tr><td colspan="3">512K</td><td colspan="2">512K</td></tr>
<tr><td colspan="5">1024K</td></tr>
</table>

2. Resource allocation in a computer system has produced the following:

Process **A** holds resource **t** and requests resources **q** and **m**

Process **B** holds resources **w** and **r** and requests resource **o**

Process **C** holds no resources and requests resources **w** and **t**

Process **D** holds resource **q** and requests resources **o** and **t**

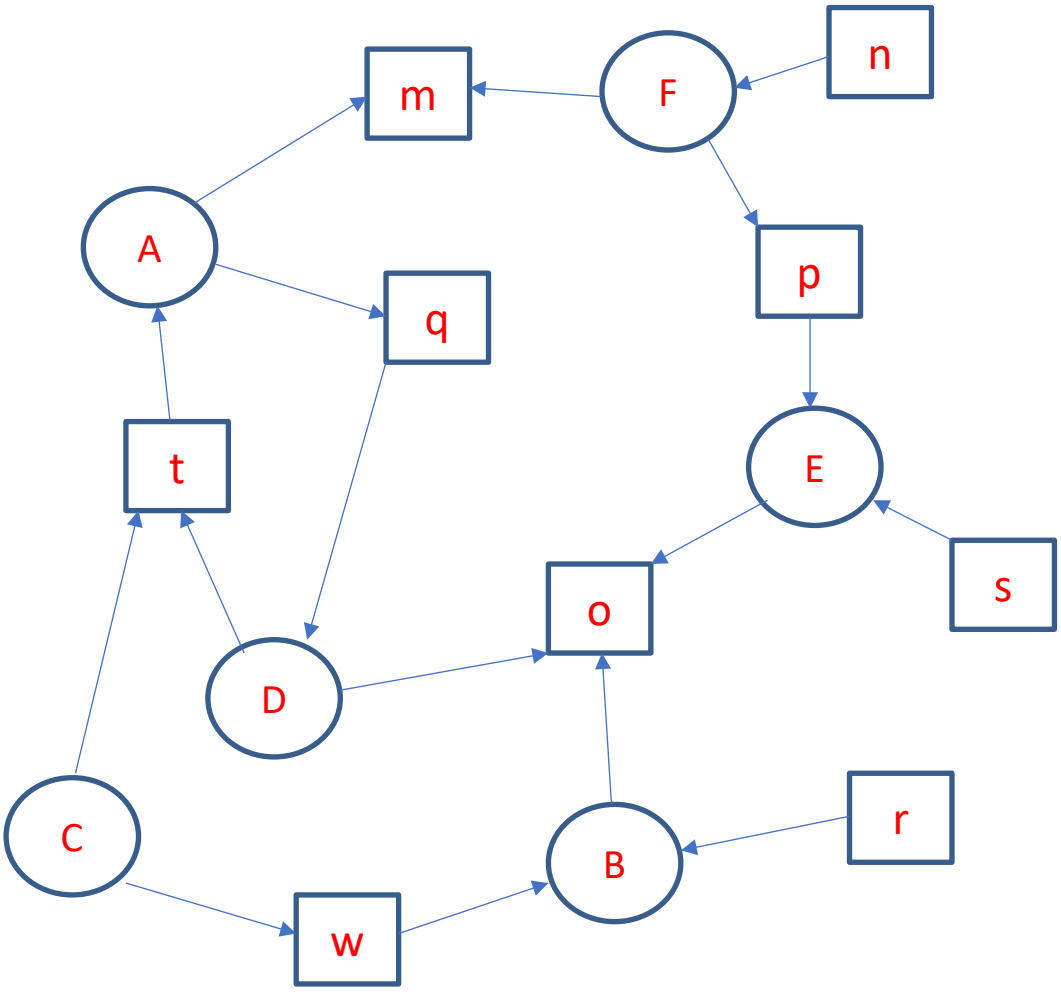
Process **E** holds resource **p** and **s** and requests resource **o**

Process **F** holds resource **n** and requests resources **m** and **p**

Note there are and only one instance all other resources on the system.

i. Draw a resource-allocation diagram showing the current state of the system

ii. Describe the order in which the processes can complete. In your answer, highlight any potential or existing deadlocks clearly indicating which processes and resources are involved.



ii) if process B is allocated resource o it can complete releasing w,o and r and
if process E is then allocated resource o it can complete releasing resource p
or E 1st then B
then
if process F is allocated resource m and is allocated p it can complete

process A, and D are in deadlock which blocks resources t and q
process C is blocked as it requires resource t

if resource o is allocated to process D then B,E and F will be blocked

3. Given a computer system using a linked list memory management scheme, with the following free list:

	Size
Element 1	250K
Element 2	200K
Element 3	170K
Element 4	300K
Element 5	200K

Using suitable tables, show how memory is allocated for each of the following memory management schemes:

- First fit
- Next fit
- Best fit
- Worst fit

In your answer, assume that the following four requests arrive in the order specified below:

Process 1	100K
Process 2	50K
Process 3	155K
Process 4	80K
Process 5	200K

First fit	250K	200K	170K	300K	200K
P1 100K	**150K**	200K	170K	300K	200K
P2 50K	**100K**	200K	170K	300K	200K
P3 155K	100K	**45K**	170K	300K	200K
P4 80K	**20K**	45K	170K	300K	200K
P5 200K	20K	45K	170K	**100K**	200K

Next fit	250K	200K	170K	300K	200K
P1 100K	**150K**	200K	170K	300K	200K
P2 50K	**100K**	200K	170K	300K	200K
P3 155K	100K	**45K**	170K	300K	200K
P4 80K	100K	45K	**90K**	300K	200K
P5 200K	100K	45K	90K	**100K**	200K

Best fit	250K	200K	170K	300K	200K
P1 100K	250K	200K	**70K**	300K	200K
P2 50K	250K	200K	**20K**	300K	200K
P3 155K	250K	**45K**	20K	300K	200K
P4 80K	250K	45K	20K	300K	**120K**
P5 200K	**50K**	45K	20K	300K	120K

Worst fit	250K	200K	170K	300K	200K
P1 100K	250K	200K	170K	**200K**	200K
P2 50K	**200K**	200K	170K	200K	200K
P3 155K	**45K**	200K	170K	200K	200K
P4 80K	45K	**120K**	170K	200K	200K
P5 200K	45K	120K	170K	**0K**	200K

4. A virtual memory has a page size of 1024K, seven virtual pages and five physical page frames.

The page table is as follows:

Virtual Page	Page Frame
0	4
1	not in main memory
2	1
3	not in main memory
4	3
5	2
6	0

i. Generate a table showing the virtual addresses of each of the pages and the physical addresses of the existing page frames

PAGE	VIRTUAL ADDRESS	FRAME	ADDRESS
0	0000 – 1023	4	4096 – 5119
1	1024 – 2047	not in main memory	---
2	2048 – 3071	1	1024 – 2047
3	3072 – 4095	not in main memory	---
4	4096 – 5119	3	3072 – 4095
5	5120 -- 6143	2	2048 – 3071
6	6144 -- 7167	0	0000 – 1023

ii. Calculate the physical addresses for those of the following virtual addresses: 1015,4070,5130,6984

Virtual address	Mapped frame address
1015	1015- 0000 + 4096 = 5111
4070	Page Fault
5130	5130-5120 +2048 =2058
6984	6984-6144 +0000 = 0840

5. Consider the following data packet **1111010101**; insert the required hamming bits for transmission and determine their values using even parity

10 BITS – DATA

r = 4; pos 1,2,4,8

1	1	1	1	0	1	H4	0	1	0	H3	1	H2	H1

		H4	**H3**	**H2**	**H1**
		8	**4**	**2**	**1**
14		1	1	1	0
13		1	1	0	1
12		1	1	0	0
11		1	0	1	1
10		1	0	1	0
9		1	0	0	1
7		0	1	1	1
6		0	1	1	0
5		0	1	0	1
3		0	0	1	1

1	1	1	1	0	1	1	0	1	0	H3	1	H2	H1

1	1	1	1	0	1	H4	0	1	0	0	1	H2	H1

1	1	1	1	0	1	H4	0	1	0	H3	1	0	H1

1	1	1	1	0	1	H4	0	1	0	H3	1	H2	0

1	1	1	1	0	1	1	0	1	0	0	1	0	0

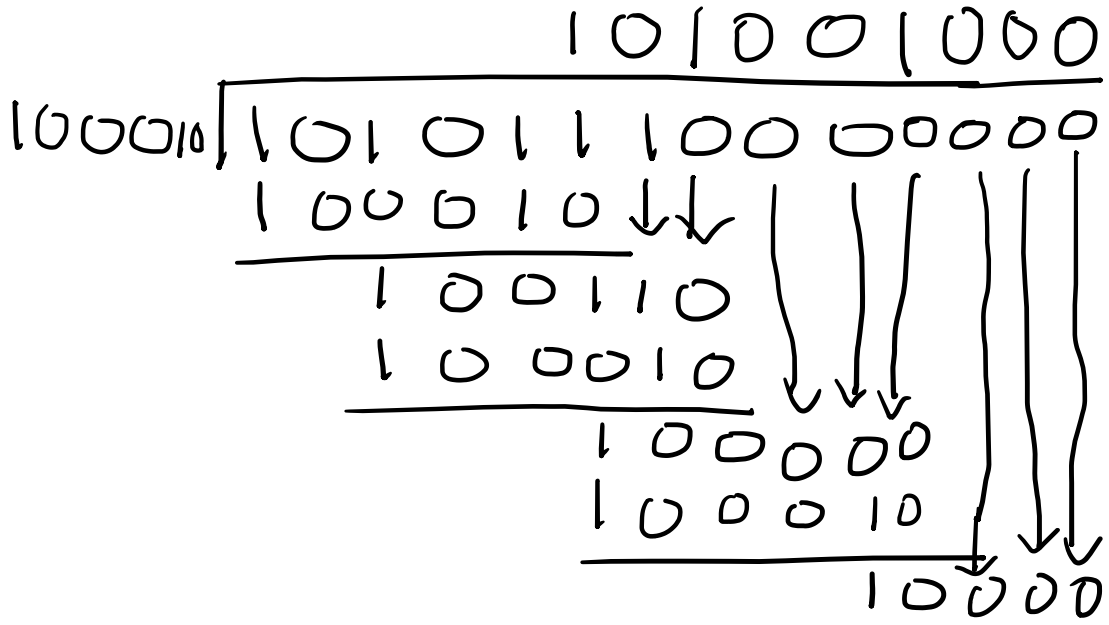
6. Considering the following data packet which includes the hamming bits with even parity, determine if there exists an error and if so the position where the error exists: **11000110100**

1	1	0	0	0	1	1	0	1	0	0
			H4				H3		H2	H1
11	10	9	8	7	6	5	4	3	2	1

H4: 1 + 1+ 0+ 0 = 2 EVEN **0**
H3: 0 + 1 + 1 + 0 = EVEN **0**
H2: 1 + 1 + 0 + 1 + 1 + 0 = EVEN **0**
H1: 1 + 0 + 0 + 1 + 1 + 0 = ODD ERROR **1**

BIT 1 IN ERROR SHOULD BE 1

7. Considering the following piece of binary data 101011100 and using 100010 as the binary polynomial divisor, generate the appropriate CRC data packet that will be transmitted.



r = 100000

CRC TO BE TRANSMITTED

101011100100000

8. Convert the following decimal number to IEEE 32-bit floating-point number representation

13.28125

Sign +ve sign bit = 0

13 : 1101

$0.28125 : \frac{1}{2} + \frac{1}{32} = 0.1001$

1101.1001

1.1011001×2^3

$3 + 127 = 130 : 10000010_2$

10000010 ^{128} Expunent

Fraction :

10110010000000000000000

0 10000010 10110010000000000000000

9. Explain giving an example what a pipe data structure is in a Unix based system

FILE DATA STRUCTURE
USES 2 FILE DESCRIPTORS
USED FOR INTERPROCESS COMMUNICATION
NORMALLY ONE DIRECTION E.G. PARENT TO CHILD
SYNCHNONISATION IS CARRIED OUT BY KERNEL

e.g. cat file1 | wc - l

10. List the stages of testing that should be carried out for software

1. Unit Testing.
2. Integration Testing.
3. System Testing.
4. Acceptance Testing.
5. Requirement Analysis of testing
6. Software Testing Planning.
7. Test Case Development.