Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2015/2016

COURSE NAME	:	DATA STRUCTURE AND ALGORITHMS
COURSE CODE	:	BIT 10703
PROGRAMME CODE	:	BIT
EXAMINATION DATE	:	JUNE / JULY 2016
DURATION	:	2 HOURS AND 30 MINUTES
INSTRUCTION	:	A) ANSWER **ALL** QUESTIONS B) PLEASE WRITE YOUR ANSWERS IN THIS QUESTION BOOKLET

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

Q1 Answer **Q1(a)-Q1(c)** based on **Figure Q1**. **Figure Q1** shows a linked list of employee data. Each node contains employee number, employee name, monthly salary and pointer to another node.

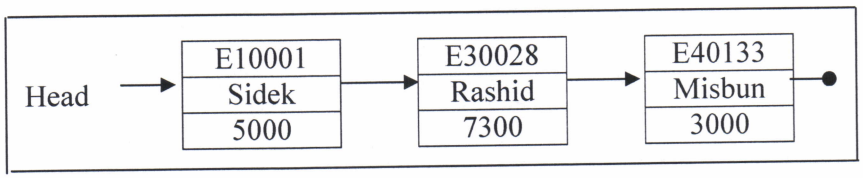

Figure Q1

(a) Declare a structure using `struct` statement to enable the data to be kept in the node.

(5 marks)

Answer:

(b) Assume the data have been input to the linked list in **Figure Q1** and head is a pointer that contains the address of the first node in the linked list. Write a program fragment that will determine sum and average of the salary.

(15 marks)

Answer:

(c) Write a program fragment to display names and salaries of all employees in the linked list using a looping statement.

(10 marks)

Answer:

Q2 (a) **Figure Q2(a)** shows a series of operations for a stack, `s1`. Determine the content of `s1` using a linked list structure and the output of the program fragment.

```
push(&s1,100);
push(&s1,200);
push(&s1,300);
push(&s1,400);
push(&s1,500);
push(&s1,600);
x=pop(&s1); printf("data= %d\n",x);
x=pop(&s1); printf("data= %d\n",x);
x=pop(&s1); printf("data= %d\n",x);
push(&s1,-10);
push(&s1,-11);
push(&s1,-12);
push(&s1,-13);
push(&s1,-14);
x=pop(&s1); printf("data= %d\n",x);
x=pop(&s1); printf("data= %d\n",x);
x=pop(&s1); printf("data= %d\n",x);
push(&s1,25);
```

Figure Q2(a)

(12 marks)

Answer:

(b) Figure **Q2(b)** shows a series of operations for a queue, `q1`. Determine the content of `q1` using a linked list structure and the output of the program fragment.

```
enqueue(&q1,125);
enqueue(&q1,277);
enqueue(&q1,394);
enqueue(&q1,178);
enqueue(&q1,-15);
enqueue(&q1,-65);
x=dequeue(&q1); printf("data= %d\n",x);
x=dequeue(&q1); printf("data= %d\n",x);
x=dequeue(&q1); printf("data= %d\n",x);
enqueue(&q1,200);
enqueue(&q1,781);
enqueue(&q1,882);
enqueue(&q1,113);
enqueue(&q1,-29);
x=dequeue(&q1); printf("data= %d\n",x);
x=dequeue(&q1); printf("data= %d\n",x);
x=dequeue(&q1); printf("data= %d\n",x);
enqueue(&q1,100);
```

Figure Q2(b)

(12 marks)

Answer:

(c) Describe a difference between stack operations and queue operations.

(1 mark)

Answer:

Q3 Answer **Q3(a)** and **Q3(b)** based on **Figure Q3**. **Figure Q3** shows an array of eight integer values.

```
int nums[NUMEL] = {22,5,67,98,45,32,74,135};
```

Figure Q3

Show the sequence of the values in the array after the fifth pass upon execution of the following sorting algorithms:

(a) bubble sort (10 marks)

Answer:

(b) selection sort (10 marks)

Answer:

Q4 (a) **Figure Q4(a)** shows a binary tree representation of integer values. Determine result for each traversal algorithm for the binary tree.

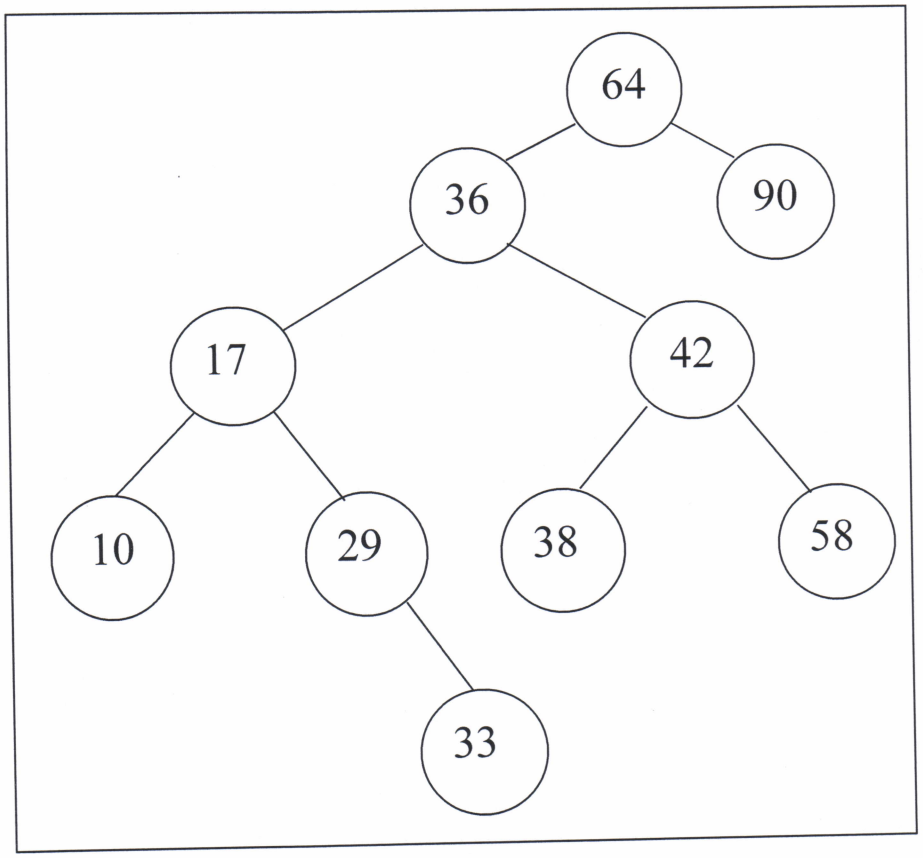

Figure Q4(a)

(15 marks)

Answer:

Traversal algorithm	**Result**
Preorder	
Inorder	
Postorder	

(b) **Figure Q4(b)** shows few lines of binary search implementation in a function. If the desired value can be found in the array `list`, the function will return the `index` of the value (location of the value in the array), else a value of -1 is to be returned. Complete the coding for the function `binarySearch` in **Figure Q4(b)**.

(10 marks)

```
#include <stdio.h>
#define TRUE 1
#define FALSE 0
#define NUMEL 10
void main(void)
{
 int nums[NUMEL] = {22,5,67,98,45,32,81,99,73,10};
 int item, location;
 int binarySearch(int [], int, int);

 location = binarySearch(nums,NUMEL,99);
 if (location>-1)
  printf("\nThe item is found at index: %d",location);
 else
  printf("\nThe item is found at index: %d",location);}

int binarySearch(int list[],int size, int value)
{
int index, found, left, right, midpt;

  index = -1;
  found = FALSE;
  left = 0;
  right = size-1;
```

Answer:

```
return(index);}
```

Figure Q4(b)

- END OF QUESTION -