UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2016/2017

COURSE NAME	:	DATA STRUCTURE
COURSE CODE	:	BIC 10404
PROGRAMME CODE	:	BIS / BIP / BIW / BIM
EXAMINATION DATE	:	JUNE 2017
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 **NINE (9)** PAGES

Q1 Answer **Q1(a) - Q1(c)** based on the program given in **Figure Q1**.

```
#include <stdio.h>
#include <stdlib.h>
int main()
{
  struct NumberList{
     int data;
     struct NumberList *next;};

  typedef struct NumberList NumberList;
  NumberList *start, *prev, *curr, *newPtr;

  int value;
  start = NULL;

  printf("\nEnter data (enter -1 to exit program):");
  scanf("%d", &value);

  while (value != -1)
  {
      newPtr = malloc(sizeof(NumberList));

      if  (newPtr != NULL){
       newPtr -> data = value;
       newPtr -> next = NULL;}

       curr = start;
       prev = NULL;

       while (curr != NULL && value > curr-> data){
           prev = curr;
           curr = curr -> next;
         }

      if (prev == NULL)
      {
        newPtr -> next = start;
        start = newPtr;
      }
      else{
        prev -> next = newPtr;
        newPtr -> next = curr;
       }

      printf("\nEnter data (enter -1 to exit program):");
      scanf("%d", &value);

  }
 printf("\n\nList of values are:");
 curr = start;
 while (curr != NULL)
 {
    printf("\nValue: %d", curr->data);
    curr = curr->next;}

 return 0;}
```

Figure Q1

(a) Complete the output for **Figure Q1**.

(11 marks)

Answer:

```
Enter data (enter -1 to exit program):78
Enter data (enter -1 to exit program):23
Enter data (enter -1 to exit program):64
Enter data (enter -1 to exit program):150
Enter data (enter -1 to exit program):41
Enter data (enter -1 to exit program):-1
```


(b) Determine the output for the program fragment in **Figure Q1(b)**. Note that the input values in **Figure Q1(a)** are applicable.

(6 marks)

```
curr = start;

while (curr!=NULL)
{
 if (curr->data % 2 == 0)
   printf("\nAnswer = %d", curr->data);

 curr = curr->next;}
```

Figure Q1(b)

Answer:

(c) Determine whether each of the following statement is **VALID** or **INVALID**. Write your answer in the column given.

(8 marks)

Statement(s)	Answer
Each node in the linked list consists of a single integer value and a pointer.	
The `malloc()` function is invoked whenever a node is to be deleted from the linked list.	
The input values will be displayed in descending order upon execution of the program.	
The insertion of the new node may occur at the beginning, middle, or at the end of the linked list.	

Q2 Answer **Q2(a) - Q2(c)** based on the programs given in **Figures Q2(a) - Q2(c)**.

```
#include <stdio.h>
#include <stdlib.h>

struct Node {
      int data;
      struct Node *next;};
typedef struct Node Node;

int main(void)
{  Node *head = NULL;
   Node *tail = NULL;
   Node *newPtr, *temp, *current;
   int item, choice;

   printf("\nEnter data (enter -1 to exit):");
   scanf("%d", &item);

   while (item != -1){
      newPtr = malloc(sizeof(Node));

      if (newPtr != NULL){
      newPtr->data = item;
      newPtr->next = NULL;

      if (head == NULL){
        head = newPtr;      }
      else{
        tail->next = newPtr;}

     tail = newPtr;}

   printf("\nEnter data (enter -1 to exit):");
   scanf("%d", &item); }

  printf("\nEnter -99 to remove data:");
  scanf("%d", &choice);

  while (choice == -99){
   temp = head;
   head = head->next;

   if(head == NULL){
     tail = NULL;}
  free(temp);
  printf("\nEnter -99 to remove data:");
  scanf("%d", &choice); }
 return 0;}
```

Figure Q2(a)

```
#include <stdio.h>
#include <stdlib.h>
struct Node {
      int data;
      struct Node *next;};

typedef struct Node Node;
int main(void)
{  Node *head = NULL;
   Node *newPtr, *temp, *current;
   int item, choice;

   printf("\nEnter data (enter -1 to exit):");
   scanf("%d", &item);

   while (item != -1){
      newPtr = malloc(sizeof(Node));

      if (newPtr != NULL){
         newPtr->data = item;
         newPtr->next = head;
         head = newPtr; }

   printf("\nEnter data (enter -1 to exit):");
   scanf("%d", &item);  }

  printf("\nEnter -99 to remove data:");
  scanf("%d", &choice);

  while (choice == -99){
   temp = head;
   head = head->next;
   free(temp);

  printf("\nEnter -99 to remove data:");
  scanf("%d", &choice);  }
 return 0;}
```


Figure Q2(b)

```
Enter data (enter -1 to exit): 67
Enter data (enter -1 to exit): 99
Enter data (enter -1 to exit): 23
Enter data (enter -1 to exit): 11
Enter data (enter -1 to exit): 45
Enter data (enter -1 to exit): 84
Enter data (enter -1 to exit): 101
Enter data (enter -1 to exit): -1
Enter -99 to remove data: -99
Enter -99 to remove data: -99
```

Figure Q2(c)

(a) Determine the final content of the linked list for **Figure Q2(a)** for the sequence of input in **Figure Q2(c)**.

(10 marks)

Answer:

(b) Determine the final content of the linked list for **Figure Q2(b)** for the sequence of input in **Figure Q2(c)**.

(10 marks)

Answer:

(c) Determine whether each of the following statement is **VALID** or **INVALID**. Write your answer in the column given.

(10 marks)

Statement(s)	Answer
The program in **Figure Q2(a)** demonstrates implementation of LIFO concept.	
The insertion procedure in **Figure Q2(a)** adds new data at the tail of the linked list.	
The program in **Figure Q2(b)** demonstrates implementation of LIFO concept.	
The removal procedure in **Figure Q2(b)** always delete the last node in the linked list.	
The program in **Figure Q2(b)** demonstrates push and pop operations in a queue concept.	

Q3 Answer **Q3(a) - Q3(b)** using the sequence of values given in **Figure Q3**.

5 2 8 1 4 7 3 12 15 10

Figure Q3

(a) Draw a binary search tree for the sequence of values given in **Figure Q3**. (10 marks)

Answer:

(b) Determine the results of each traversal algorithm for the answer in **Q3(a)**. (15 marks)

Traversal Algorithm	**Answer**
Preorder	
Inorder	
Postorder	

Q4 Answer **Q4(a) - Q4(b)** based on the sequence of values given in **Figure Q4**.

22 5 67 98 45 32 101 99 73 10

Figure Q4

(a) Show the sequence of the values from the first pass until the fifth pass of bubble sort algorithm.

(10 marks)

Answer:

(b) Show the sequence of the values from the first pass until the fifth pass of selection sort algorithm

(10 marks)

Answer:

- END OF QUESTIONS –