



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER 1
SESSION 2017/2018**

COURSE NAME : DATA STRUCTURES AND ALGORITHM
COURSE CODE : BEC 20602
PROGRAMME CODE : BEJ / BEV
EXAMINATION DATE : DECEMBER 2017 / JANUARY 2018
DURATION : 2 HOUR 30 MINUTES
INSTRUCTION : ANSWER ALL QUESTIONS

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THIS QUESTION AND ANSWER PAPER CONSISTS OF FIVE (5) PAGES

INSTRUCTION: Answer ALL questions

Q1 Answer the following questions

- (a) Consider the following code fragment below and show how the steps to find the total execution of the algorithm given.

```
for(int i=0; i<n; i++) {
    for(int j=0; j<n*n; j++)
        sum = sum + i;
    for(int k=0; k<n+n; k++)
        a[k] = a[k] + sum;
}
```

(6 marks)

- (b) What is the value of Big Oh for the statement below?

(i) Remove the value from a stack implemented as an array.

(2 mark)

(ii) Find the maximum value stored in a two dimensional array.

(2 mark)

- (c) Consider the following recursive method and draw a recursive tree for func(3)

```
int func (int j)
{
    if (j==1)
        return 1;

    return 2*func (j-1) + 5*func(j-2);
}
```

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(5 marks)

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

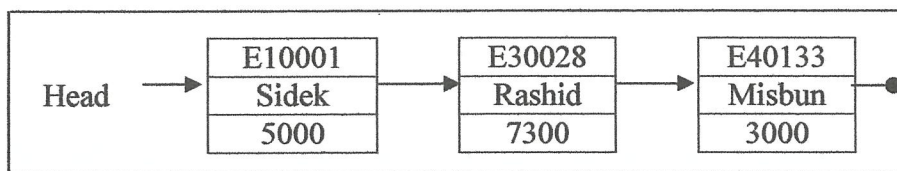


Figure Q1 (d)

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

(6 marks)

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)

(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);
    
```

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Figure Q2(b)

(12 marks)

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

(1 mark)

Q3 (a) Based on the sequence of values given in Figure Q3 (a).

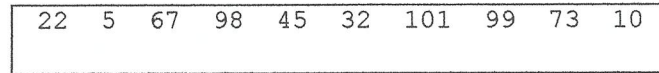


Figure Q3 (a)

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

(10 marks)

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

(10 marks)

(b) Given the following data:

19 90 25 12 30 43 6

(i) Draw a binary search tree.



(3 marks)

(ii) Construct the number of the binary search tree in Q3 (b) (i) using *inorder*, *preorder* and *postorder* traversal.

(3 marks)

(c) State the answer of (i) to (viii) based on Figure Q3 (c).

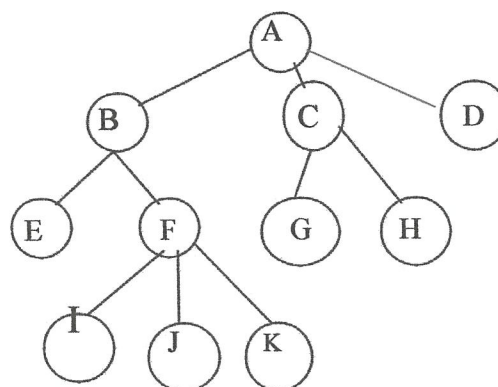


Figure Q3 (c)

- (i) Number of nodes
- (ii) Height of tree
- (iii) Depth of F
- (iv) External nodes
- (v) Internal nodes

- (vi) Ancestors of J
- (vii) Descendants of B
- (viii) Siblings of J

(8 marks)

(d) Show the resulting heap after each of the following alterations is made consecutively to the Heap object in Figure Q3 (d).

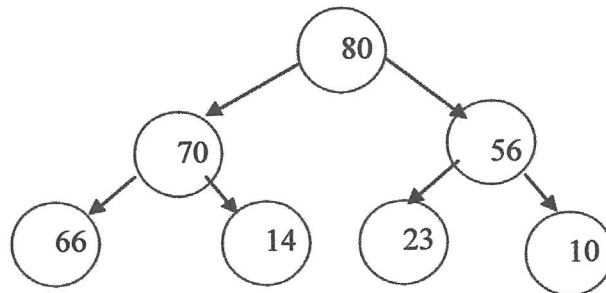


Figure Q3 (d)

(i) Add node 84

(2 marks)

(ii) Delete a maximum number

(3 marks)

Q4 Examine the shortest path from node A to all nodes in Figure Q4 using Dijkstra's algorithm. Provide table and diagram for your answer.

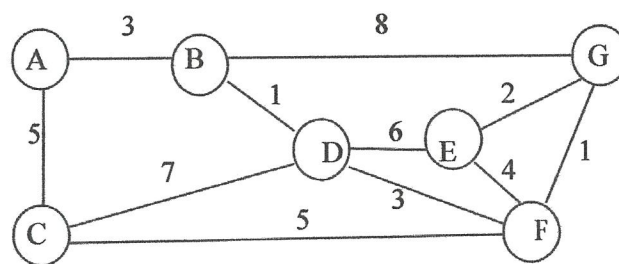


Figure Q4

(15 marks)

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- END OF QUESTIONS -