End Sem Lab Exam
IT204 Data Structure and Algorithma
Max Marks: 40 Time 4hours (1)

Q1: Implement 3 Stacks on an array of size 21 elements. **10M**

Q2: Implement the ~~selection~~ insertion sort on the doubly link list.(Swap values only) **15M**

Q3: Consider we have updated a value of any node in the BST and after updation the new value may voilate the properties of BST. Implement the function to check that BST is valid or not. (Just return TRUE of FALSE as an output function) **15M**

SET D

1. Write a shell script program that takes a file name as a input from the user and checks whether the given file has read access, write access and execute permission. Check whether it is ordinary file, special file or directory file. Check whether the file size is 0 or not and Check whether the file exist or not. 10M

2. Write script to print given numbers sum of all digit, For eg. If no is 123 it's sum of all digit will be 1+2+3 = 6. 5M

3) Write shell script to print alternate digits when a 7 digit number is passed as input 5M

Mid Sem lab Exam
Max Marks 24
Reg Number

Duration : 2:40

1	4	I	T	1	5	3

1. Let there are N(let N is even number) elements in the doubly link list and exactly N/2 are ever and N/2 are odd number randomly distributed in the list. Now write the function to pair wise swap the ith odd number with ith even number. **24**

Input : 22<->14<->36<->17<->13<->18<->15<->27
Output : 17<->13<->15<->22<->14<->27<->36<->18

2. Write a function to swap pair wise adjacent nodes in the link singly link list . **18**

1 -> 2-> 3->4 ->5->6->7->8 ====> 2->1->4->3->6->5->8->7

DEPARTMENT OF INFORMATION TECHNOLOGY, NITK SURATKAL

END SEMESTER EXAMINATION, NOVEMBER, 2015

IT201 DIGITAL DESIGN AND COMPUTER SYSTEM ORGANIZATION

Class : III Semester IT — Time: 3 Hours

Date : 30-11-2015 — Maximum Marks: 50

Register No | 1 | 4 | I | T | 1 | 5 | 3 |

Answer all the questions and answer to the point.

Write steps or diagrams wherever necessary.

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1. a). Explain in detail how the connections are done between the processor and memory. List the steps needed to execute the below machine instructions in terms of transfers between the components and some simple control commands.

Load LOCA,R1

Add R1,R0 — 5M

b). Write a straight line program using a loop for adding n numbers with the starting address "i" and explain the same program with a figure. — 2M

2. Explain the modes which are used on various platforms and architectures for which the operand of an instruction is specified. — 5M

3. Explain the subroutine stack frame with an example. What is subroutine nesting. Explain with an example how parameters are passed through registers. — 5M

4. What is the purpose of DMA. Write a program that reads one line from the keyboard, stores it in memory buffer, and echoes it back to the display. — 5M

5. a). Explain the Handshake control of data transfers during input and output operation. — 5M

b). Divide A=11 and B=5 using Restoring division method and Non-Restoring. — 4M

6. Write a short note on Hardwired control and micro-programmed control with a figure. 6M

7. Explain with example 3 types of hazards that make the pipeline to stall for a particular clock cycles. 6M

8. a). Design the Serial In Parallel Out and Parallel In Serial Out register and explain with an example 4M

b). Design 4bit Carry Lookahead Adder 3M

DEPARTMENT OF INFORMATION TECHNOLOGY, NITK SURATHKAL

III Semester B. Tech (IT) END SEM EXAMINATION NOV-DEC 2015

IT 200: DATA STRUCTURES AND ALGORITHMS

Time: 3 Hrs.
Date: 26/11/2015

Max Marks: 100

Register No. | 1 | 4 | I | T | 1 | 5 | 3 |

Note: Answer all Questions to the Point.

---

1. (a) Write a function to reverse the links in a linked list such that the last node becomes the first and the first node becomes the last by traversing the linked list only once. (8)

   (b) Define a structure for an employee of an organization having employee code, name, address, phone number and number of dependents. Assume that "allEmployees" is stored in a doubly link list of employees in the ascending order on their employee code. Write a function to insert the details of an employee. (8)

2. Find the Big O order of the following program. (8)

```
fn(n){

        if n<=1 then
                return 1;

        else
                sum = fn(n/2)+fn(n/2)
                for i = 1 to n
                do
                        count++;
                end do
         end if

}
```

3. (a) Explain the generalize equation of Quick Sort and derive the best case, worst case of the algorithms using the generalized equation. (10)

   (b) Write an algorithm for Heap Sort and do the detailed analysis of heap sort (let us assume that we have built in build-heap subroutine to create the heap in O(n) time) (12)

   (c) Suppose we have an array size "n" and the values stored in them are having maximum "m" digit. Write an algorithm that guaranteed to have running time bound by O(m*n) (8)

4. Convert the following infix notation into postfix notation using the stack (Show the steps needed to convert with stack content) where priority table is given below (Higher Number represents higher priority) "10+20*10/2*2^2^2/5/2" and evaluate the equation (10)

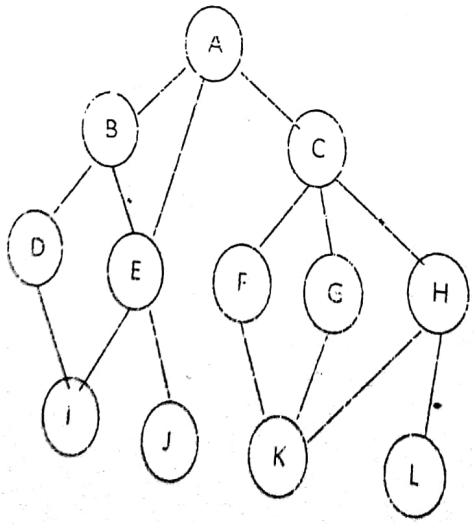
Operator	+	-	*	/	^
Priority	1	1	2	2	3
Association	Left	Left	Left	Left	Right

5. Prove the correctness of the Dijkstra Algorithm for Single Source Shortest Path algorithms. (8)

6. Draw the AVL Tree for preorder traversal given by 50, 25, 15, 10, 20, 22, 30, 28, 65, 60, 63, and 70. Delete the node with value 70 in the given AVL Tree. (10)

7. Suppose that we have 3 assembly lines for solving the assembly line scheduling problem using "Dynamic Programming Technique". (10)

8. Traverse the following graph given below using DFS algorithms and list the tree edges and back edges of the traversal (use alphabetic order to break the tie) (8)



DEPARTMENT OF INFORMATION TECHNOLOGY, NITK, SURATHKAL
END-SEMESTER EXAMINATIONS (JAN-MAY 2016 SESSION)
IT253: PARADIGMS OF PROGRAMMING-II

Time: 3 hrs

Marks: 100

Class: IV SEM B.TECH(IT)

Date: 27-04-2016

Register No	1	4	I	T	1	5	3

Note: Answer all the Questions to the Point.

1. Explain how Python supports different paradigms with suitable example and the program. **(10)**

2. Consider input.txt file which contains random text. Write a Python program to open the file, read the file, and count the number of characters, words, lines. Write the output to results.txt file and close the both input and result files. **(10)**

3. (a) Write a BNF Grammar for the language of course codes.

CV2IV251 (Department_Year_Semester_CourseId)
IT2IV253
CS3VI350
PHY1I112
ME1I125 **(5)**

(b) Consider the following Grammar.

E ::= NUM | (E OP E)
NUM ::= 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9
OP ::= + | - | * | /

Develop a Parse Tree for **(B - ((C + D) * A) +D)** **(5)**

4. Explain the Array Categories based on the (i) binding subscript ranges, (ii) the binding to storage, and (iii) from where the storage is allocated. **(10)**

5. Explain the Android Architecture in detail. **(10)**

6. How the Process Virtual Machine is different from System Virtual Machine? Explain with appropriate examples. **(10)**

7. (a) Write a LISP program to print the Fibonacci Series up to a user specified Limit. **(5)**

(b) Write a LISP code to find a Factorial of a Number. **(5)**

DEPARTMENT OF INFORMATION TECHNOLOGY, NITK SURATKAL

END SEMESTER EXAMINATION, NOVEMBER 2015

IT202 UNIX PROGRAMMING AND PRACTISE

Class : III Semester IT

Time: 3 Hours

Date : 27-11-2015

Maximum Marks: 40

Register No	1	4	J	T	1	5	3

Answer all the questions and answer to the point.

Write steps, programs or diagrams wherever necessary.

---

1 a) Explain the following commands 4M

umask 022

grep -n '[dD]on\'t' tasks

pr –t emp.txt

touch –m 0303 10 30 vtu.txt

b) Explain the list of insert commands in VI editor? Explain the commands to move the cursor along a line in VI editor 3M

c) Write a program in awk to store the totals of the basic pay, DA, HRA, and gross pay of the sales and marketing people. → Use shell script 3M

2 a) What is shell script? Explain the following statements with syntax and examples? 4M

i. if

ii. case

iii. while

b) Explain what these wild card patterns match 4M

i). [A-Z]????*

ii). *[0-9]*

iii). *[!0-9]

iv). *.[!s][!h].

c) How would you write a shell script that prints all the arguments passed to it in reverse order? 2M

3 a) What are special characters that can be used in shell script 4M

abc. (V)

abcc

b) Write a command that will do the following:

Look for all files in the current and subsequent directories with an extension c,v

Strip the,v from the result (you can use sed command)

Use the result and use a grep command to search for all occurrences of the word ORANGE in the files. 3M

c) How would you count every occurrence of the term "potato" in all the files appearing under the current directory, and its subdirectories, recursively? 3M

4 a) What is a process? Explain the mechanism of process creation? 3M

b) What is the output of the below code? 3M

```
void exit_handler1();
void exit_handler2();
int main() {
int pid;
atexit(exit_handler1);
atexit(exit_handler2);
pid = fork();
if(pid == 0) {
    exit(0);
} else {
  sleep(2);
  exit(0);
  }return 0;
}
```

c) Explain different file tests, character string test and arithmetic test that can be performed in shell scripting 4M

DEPARTMENT OF INFORMATION TECHNOLOGY, NITK SURATHKAL
III Semester B.Tech (IT) END SEM EXAMINATION, November-2015
IT 206: PARADIGMS OF PROGRAMMING - I

Time:180 Minutes
Max Marks: 100
Date: 25-11-2015

Register No: 1 4 5 5 1 5 3

Note 1. Answer all questions.
2. Do not write on the question paper, except the Register No.
3. pseudo code = Not the actual code, but code without actual language syntax.

1.

Given a statement: "*A boone is a house that has a family and pet dogs*". Write the class diagram and define the classes for implementing the above requirement.

Given below is a class, HasVariables. Mention exactly at what point the variables x, y, n, a[], Integer[] are initialized and to what value?

```
class HasVariables {
        int x = 20;
        static int y = 30;
        HasVariables () {
        }
        public void aMethod () {
                int a[] = new int[3];
                Integer al[] = new Integer[1];
                int n;
        }
}
```

- (5+5) Marks

2. Briefly explain the Life Cycle of a Thread with the help of a block diagram. Explain the differences between the Thread States "wait" and "blocked" with the help of a suitable example.

- 10 Marks

3. Answer the following

Briefly explain with the help of source code, how Constructors of a class and 'finally' keyword are related and can be working together to ensure the class is designed properly and error/bug free.

Explain Late Binding with the help of an example. - (5+5) Marks

4. What are Threads and why are they important? Write the source code to implement 2 different ways of creating Threads. Using one of the Threads you have created, write the source code and explain the 'synchronization' of the Thread.

- 10 Marks

5. Given below are the member variables for an Employee of the Company. Create the class definition(s), add critical member functions to access member variables. Note that all the necessary O-O related concepts must be included within the class. Note that the coding standards, good design principles must be incorporated while defining this class(es).

Employee Identifier, Employee name, Employee Salary, Street name, City name, State name, Zip.

Once you have the classes defined, create pseudo code for 2 different ways to write the data from the Employee object to the persistent storage.

- (5+5) Marks

6. Mention the steps as to how the Event Handling is achieved in Java GUI with the help of Button class and the necessary source code. Given keywords: class JButton, interface ActionListener, function ActionPerformed. Click of the button should print "Hello Java" to the user using the System package.

What are Anonymous Classes? Write the source code for a GUI Anonymous class.

- (5+5) Marks

7. What are Java Collections? What are the various benefits of Collections? With an example, explain how the concept of data structures are simplified using Collections in Java. (Need to show how sorting and searching is simplified – write pseudo code where necessary).

- 10 Marks

8. Check if the below 3 source code pieces marked (a), (b) and (c) compile without any errors (Ignore warnings). If not, correct the code with minimal changes. (Need not re-write the code) What would be the output of the code when it compiles without errors?

- 3 X 10 Marks

(a)

```
public class AutoHolder {
    public static void main(String[] args) {
        Holder <Automobile> h = new Holder(new Automobile());
        h.display();
    }
}
class Automobile {
    private String name = "This is an automobile";
```

```
        String getName() {
        return name;
    }
}
class Holder <T> {
    private T a;
    public Holder (T a) { this.a = a;}
    public void set(T a) { this.a = a; }
    public T get() { return a; }
    public void display() {
        Holder <Automobile> h = new Holder (new Automobile());
        Automobile a = h.get();
        h3.set("Not an Automobile");
        h3.set(1);
        h.set(a);
        System.out.println(h.get().getName());
    }
}
```

(b) ----------

```
class Parcel2 {
    class Contents {
        private int i = 11;
        public int value() { return i; }
    }
    class Destination {
        private String label;
        Destination(String whereTo) {label = whereTo;}
        String readLabel() { return label; }
    }
    Destination to(String s) { return new Destination(s); }
    Contents contents() {return new Contents();}
    void ship(String dest) {
        Contents c = contents();
        Destination d = to(dest);
        System.out.println(d.readLabel());
    }
    void trackParcel() {
        Parcel2 p = new Parcel2();
        p.ship("Tasmania");
        Parcel2 q = new Parcel2();
        Parcel2.Contents c = q.contents();
        Parcel2.Destination d = q.to("Borneo");
        d.readLabel();
    }
}
```

Parcel2 p = new Parcel
p.trackParce

(c)

```
class MyException2 extends Exception {
        private int x;
        MyException2() {}
        MyException2(String msg) {
        super(msg);
 }
 MyException2(String msg, int x) {
        super(msg);
        this.x = x;
 }
 public int val() { return x; }
        public String getMessage() {
                return "Detail Message: "+ x + " "+ super.getMessage();
        }
 }
 class ExtraFeatures {
        public static void f() throws MyException2 {
                System.out.println("Throwing MyException2 from f()");
                throw new MyException2();
        }
        public static void g() throws MyException2 {
                System.out.println("Throwing MyException2 from g()");
                throw new MyException2("Originated in g()");
        }
        public static void h() throws MyException2 {
                System.out.println("Throwing MyException2 from h()");
                throw new MyException2("Originated in h()", 47);
        }
        void raiseException() {
                try { f(); }
                catch(MyException2 e) {
                        System.out.println("At catch of MyException2 - 1");
                }
                try { g(); }
                catch(MyException2 e) {System.out.println("MyException2 Error - 2");}
                try { h(); }
                catch(MyException2 e) {
                        System.out.println("At catch of MyException2 - 3");
                        System.out.println("e.val() = " + e.val());
                }
        }
}
```

fesv main()

Registration No.:	1	4	I	T	1	5	3

Department of Mathematical and Computational Sciences
National Institute of Technology Karnataka, Surathkal

Examination: End Semester - Part A — **Maximum Marks: 65**
Odd Semester (2015-16) — **Course Code: MA 200**
Course Name: Mathematical Foundations of Information Technology
Date: 24/11/2015 — **Time: 9.00 a.m to 12 p.m**

INSTRUCTIONS:

1. Answer ALL the ten questions.
2. Rough work should NOT be done anywhere on the Question Paper.
3. Do the indexing properly. You will be penalized if you do not do the indexing.

Q.1. Prove that a graph of n vertices is a tree if and only if it is connected and has $n-1$ edges. [6]

Q.2. Show that there is no simple graph having 12 vertices and 26 edges in which the degree of each vertex is either 3 or 6. [6]

Q.3. G is a 5-regular simple planar graph. In a plane representation of G, each region is bounded by 3 edges. Find the number of edges in G. [5]

Q.4. Suppose there are 10 persons (referred to by 1, 2, ..., 10), who are part of the following seven committees: $c_1 = \{1,2,3\}, c_2 = \{1,3,4,5\}, c_3 = \{2,5,6,7\}, c_4 = \{4,7,8,9\}, c_5 = \{2,6,7\}$, $c_6 = \{8,9,10\}, c_7 = \{1,3,9,10\}$. A minimum of how many different time periods on a particular day are needed so that meetings of all these seven committees can be arranged in such a manner that no two committees meet during the same period if they have a member in common? Suggest such an arrangement. [7]

Q.5. Three boys b1 , b2 , b3 and four girls g1 , g2 , g3 , g4 are such that (i) b1 likes g1 , g3 , g4 . (ii) b2 likes g2 and g4 (iii) b3 likes g2 and g3 . Can every one of the boys marry a girl whom he likes? State some result to justify your answer. If possible, find one such arrangement where each boy marries a girl whom he likes. [5]

Q.6. Suppose that a coin is tossed twice so that the sample space is $S = \{HH, HT, TH, TT\}$. Let X represent the number of heads that can come up.

(a) Write out the probability mass function corresponding to the random variable X. [3]

(b) Write out the cumulative distribution function for X. [3]

Q.7. Suppose a dart is thrown at a circular target with radius 6 metres. Assume that whenever a dart is thrown, it always hits the target, never misses it. If it lands at a point having distance less than or equal to 1 metre from the center, you win Rs. 5. If it lands at a point having a distance greater than 1 but less than or equal to 4 metres from the center, you win Rs. 10. Otherwise, you lose Rs. 8.

(a) If the dart is thrown once, what is the probability that you win Rs.10? [3]

(b) If the dart is thrown a large number of times, then are you expected to win some money, or lose some money? Explain. [5]

Q.8. The probability of a man hitting a target is 1/4.

(a) If he fires 7 times, what is the probability of his hitting the target at least twice? [3]

(b) How many times must he fire so that the probability of his hitting the target at least once is greater than 2/3?

Q.9. If a bank receives on an average 6 bad cheques daily, what is the probability that it will receive 4 bad cheques on a given day? What is the probability that it will receive at least 5 bad cheques from Monday to Wednesday in a given week?

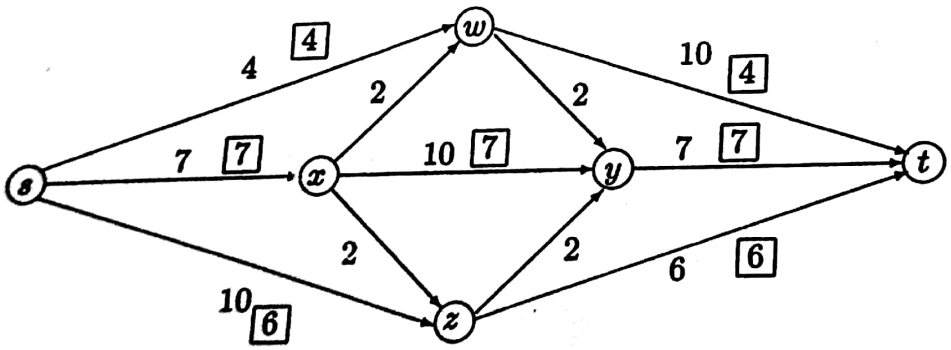
Q.10. Consider the following problem:

The figure below shows a flow network on which an s-t flow is shown. The capacity of each edge appears as a label next to the edge, and the numbers in boxes give the amount of flow sent on each edge. (Edges without boxed numbers have no flow being sent on them.)

(a) What is the value of this flow?

(b) Is this a maximum s-t flow in this graph? If not, find a maximum s-t flow.

(c) Find a minimum s-t cut. (Specify which vertices belong to the sets of the cut.)



DEPARTMENT OF INFORMATION TECHNOLOGY, NITK SURATHKAL

MID SEMESTER EXAMINATION, SEPTEMBER 2015

IT202: UNIX PROGRAMMING AND PRACTISE

Class: III SEM B.Tech. (IT) **Time: 1½ Hrs.**
Date: 09/09/2015 **Marks: 20**

Register No. | 1 | 4 | I | T | 1 | 5 | 3 |

NOTE: 1. Answer all question

---

1. a) Explain the UNIX architecture with suitable example. (3)
   b) You have a tab-separated file, which contains Name, Address and Phone Number, list down all Phone Number without there name and Addresses? (1)
   c) How do you find whether your system is 32 bit or 64 bit ? (1)

2. a) What are inodes in UNIX system? Differentiate between hard link and symbolic link. (3)
   b) How do you find which process is using a particular file? (1)
   c) How can you remove the 7th line from a file and the changes should be reflected in the original file? (1)

3. a) What is "chmod" command? What do you understand by this line "r-- -w- --x? (2)
   b) How will you run a process in background? How will you bring that into foreground and how will you kill that process? (2)
   c) Write a command to print the lines that has the word "july" in all the files in a directory and also suppress the filename in the output. (1)

4. a) What are the different file types available in UNIX? Write the command to create all the files (4)
   b) Remove all tags from a html with a bash script using the sed command (1)

DEPARTMENT OF INFORMATION TECHNOLOGY, NITK SURATKAL

MID SEMESTER EXAMINATION, SEPTEMBER 2015

IT201 DIGITAL DESIGN AND COMPUTER ORGANIZATION

Class : III Semester IT

Time: 1 and 1/2 Hours

Date : 11-09-2015

Maximum Marks: 30

Register No | 1 | 4 | I | T | 1 | 5 | 3 |

Answer all the questions and answer to the point.
Write steps or diagrams wherever necessary.

---

1. Explain the Jack Kilby flip flop. Convert that flip flop into set reset flip flop. **5M**

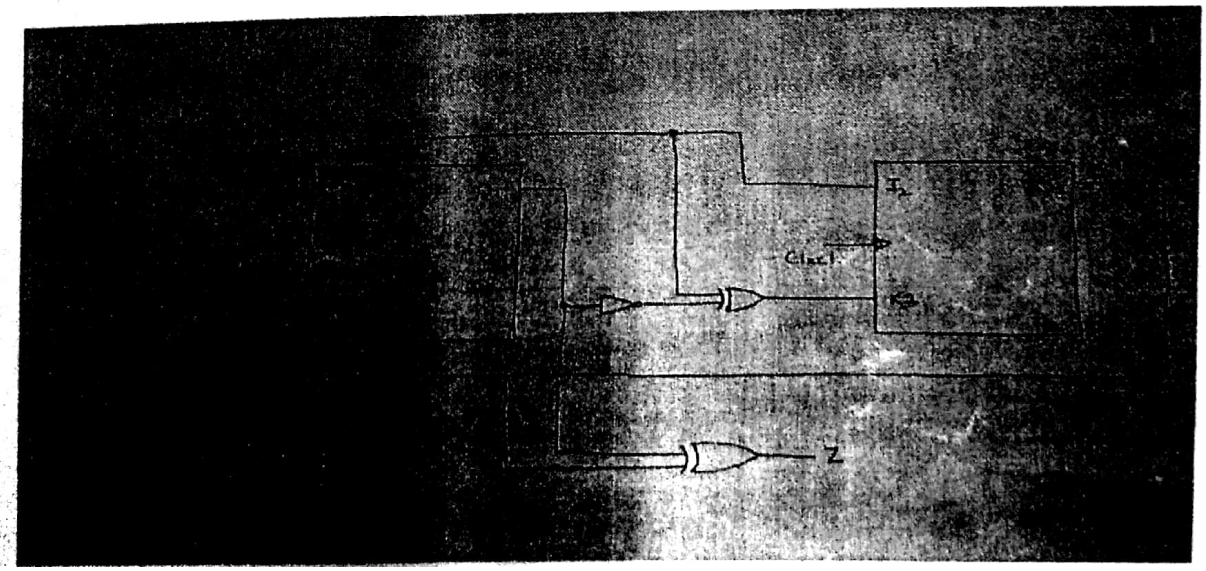
2. Design a 4 bit counter using D flip flop and also give its State table, K-maps and Sequence diagram. **5M**

3. What is Registers and how loading and shifting is done. Explain Parallel in Serial out (PISO) register in detail. **5M**

4. Implement the following function using 16 to 1 MUX and draw the circuit $F(A,B,C,D) = \sum(1,2,4,7,8,11,13,14)$. **5M**

5. Content of a 4 bit shift register is initially 1101. The register is shifter six times to the right with the serial input 101101. What is the content of the register after each shift. **5M**

6. Design the Sequence diagram and State table. **5M**



DEPARTMENT OF INFORMATION TECHNOLOGY, NITK SURATHKAL

MID SEMESTER EXAMINATION, SEPTEMBER 2015

IT200: Data Structure and Algorithms

Class: III SEM B.TECH (IT)
Date: 08/09/2015

Time: 1½ Hrs.
Max. Marks: 50

Register No.

1	4	I	T	1	5	3

NOTE: 1. Answer All Questions To The Point

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1. Solve the following recurrence relation
   1.1. $T(n) = 3T(n-1) + 1$ **4M**
   1.2. $T(n) = 4T(n/4) + c*n$ **4M**

2. Write an algorithm to delete all the nodes in the singly link list whose location is in multiple of "k" where "k" is pass as an argument to the given delete function. **8M**

3. Write the PUSH and POP operation for a stack "i" (for all i<k) where we implementing k different stack in a single array of size N(consider N= k*m) **8M**

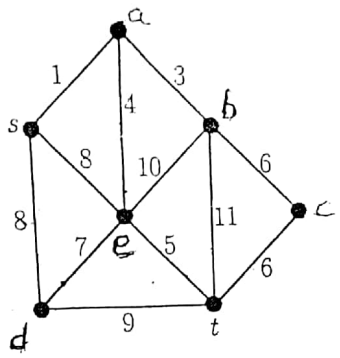
4. Consider an application where we want to implement a service program such that service is provided on the first come first serve basis and maximum 10 people are allowed to wait for the service. Suggest best data structure for given scenario with its implementation. **8M**

5. Consider if we insert the 'n' elements in a BST in the ascending order then what will be the worst case time complexity of (i) search(T, x) **(ii)** findMinimum(T). function. **4M**

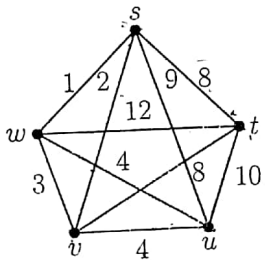
6. Write the procedure to delete a node in the doubly link list. **6M**

7. Explain the case where we delete the node with right child but its right child doesn't have left child **8M**

Q.7. (a) For the weighted graph below, the weight of each edge represents the length of a direct route between its two endpoints. Apply Dijkstra's Algorithm to find the minimum distance between s and t. Also find a path corresponding to the minmum distance. [8]



(b) For the weighted graph below, use Kruskal's Algorithm to find a minimal spanning tree. Clearly indicate the edges which you are selecting at various stages. Also find the weight of the minimal spanning tree. [4]



(This question paper contains 2 page(s) and 7 Questions.)