Important Announcements

Wish you a Happy New Year - 2014

We shall be meeting every month henceforth

New features are being added

Winners for the (Savaal) सवाल Time will be awarded prizes

Request Contributions / Articles from Student Members to publish

Message from CSI Leadership

EXCLUSIVE PORTAL FOR STUDENTS LAUNCHED

Student members and Student branches are the most important stakeholders of the CSI family. We are pleased to inform you that an exclusive portal for students has been launched. The same can be accessed through our main portal www.csi-india.org under the student’s corner link. Student branches themselves can now post the announcement of their events and event reports alongside photographs. Student members can submit articles, apps, projects and benefit in many more ways. Going forward, we intend to add other features such as internships, contests, placement facilitation and much more.

Senior CSI members have volunteered their time as mentors for making this portal a success. We urge you to use the same effectively. We have made a beginning and with your support intend to continuously improve and add more features.

Do feel free to share your feedback through the feedback option to help us in this initiative.

This is your portal. Be part of this new beginning and help us make it one that provides immense value to you, our members.

RAJAN JOSEPH MINI ULANAT
DIRECTOR - EDUCATION NATIONAL STUDENT COORDINATOR

You can give instant feedback for whizkidd! Click here. E-Mail your contributions to:
whizkidd.csi@gmail.com
mail2whizkidd@csi-india.org

Like us in Facebook:
https://www.facebook.com/csiwhizkidd

You can give instant feedback for whizkidd! Click here. E-Mail your contributions to:
whizkidd.csi@gmail.com
mail2whizkidd@csi-india.org

Like us in Facebook:
https://www.facebook.com/csiwhizkidd

Creative Team

Dr. R. Manimegalai
Prof. P. Kumar
Ms. B. Shanmugha Priya

CSI Editorial Support Team

Dr. Shirish S. Sane
Dr. A. K. Nayak
Mr. H. R. Mohan

Promoted and Presented by

CSI Education Directorate
CSI National Headquarters
Taramani, Chennai - 600113.

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Every technology can be a boon as well as a bane for mankind. The internet scenario is no exception to this. The growth of information technology has proved beneficial in numerous ways but has not eliminated the possible misuse of the technology. Cyber crimes reflect the exploitation of the technology for negative purposes. In general, cyber crimes may be defined as unlawful activities in the cyberspace.

The advent of cyber crimes may be attributed to the increased activity of people in the cyberspace. Along with cyberspace, the concept of netizens has also evolved over a period of time. Initially the population of “netizens “was small as the Internet was viewed as a tool to be used by people with relevant technical knowledge. Over the years, the population of netizens has been steadily growing as the technology has become much simpler to use. Now it has people of all age groups: e-mail, browsing and then e-commerce in a big way all have contributed the extensive use of internet. Now, the activities of the netizens are no longer restricted to their business needs. Whether it is paying the bills for the basic amenities or it is planning a get-together, the Internet is seen as a medium. The increasing number of social networking sites has made the cyberspace a twin of the physical world.

Like the real world, there is unpleasantness in the cyberspace as well. The increasing number of cyber crimes against individuals brings out this fact. The crimes against individuals may be classified on the basis of age groups of the people or victims as:
Crimes against Adults

Crimes against Children and Adolescents

Adults as victims are targets for number of cyber crimes. The Kaushambi murder case [1] brings out that even adults are lured into false relationships and victimized. Financial crimes like phishing, credit card frauds and money laundering form the major types of crimes targeted against adults. The spread of e-commerce has increased the use of credit cards and internet banking. Most of these crimes are carried through emails. Users may receive fraudulent emails which may appear to be from banking or financial institution where they have their bank account. Another form of phishing is where the victim is informed through email that he has been chosen as a winner of an online lottery or online survey. The banking credentials are stolen by means of a phishing link. People unaware of such threats are easy victims for fraudsters who are on the lookout for easy targets. Lack of awareness among people about the threats posed by the Internet and the necessary precautionary measures acts as the major factor for the cyber crimes and frauds. Phishing is the type of crime where a website very similar to that of the bank where the user is a client appears and he tends to perform internet banking without sensing the danger.

Another type of cyber crime targeted against individuals is the employment scam. Employment scams offer part-time or home based jobs for lucrative salary. Most of these scams involve an initial payment from the interested individuals. These initial payments range from few hundreds to about two-three thousand rupees. The amount may be seen as marginal by many individuals who readily make the payment. In return, no job opportunities are provided. The attacker may collect small amount of money from a number of individuals in order to avoid suspicion and scrutiny. People may be used as mules to promote objectionable material. Some employment scams offer bonus for forwarding the employment offer to others. By offering lucrative opportunities, intruders can easily harvest genuine email ids and misuse them. Spam mails and email spoofing are crimes which may be benefitted by harvesting email ids. Also some intruders collect email ids through employment scams and offer the database of email ids to attackers for huge sums of money.
The advent of e-commerce has given way for online auctions and online stores. Whether it is books, apparels or electronic items, anything can be bought from an e-store. Auction portals like eBay have a large catalogue of items that can be bought or sold through them. On one hand these portals ease the process of buying and selling goods but on the other they are the home grounds for a number of fraudulent activities. Fraudsters use these portals for money laundering purpose. People may be cheated in a number of ways. They may have made an online payment for some item which may not be delivered to them or the delivered item may not be the same as the bought item. Counterfeit and smuggled goods may also be sold through these portals. Intruders may lay phishing traps and gain access to information like the credit card numbers and passwords for internet banking.

Another form of financial fraud is the charity scam. Fraudsters pose as member of welfare societies and NGOs and send emails requesting for monetary help for carrying out some welfare activities like rehabilitation of flood victims or victims of some epidemic, etc. These mails usually provide a link through which the donors may make their payments. This link would be a phishing link through which the internet banking details such as username and password of the donor are stolen. In addition to the payment made by the donor, the fraudster may indulge into money laundering any time later using the credentials stolen from the donor. A variation of the charity scam is where the victim is informed through emails that he has inherited some fortune left by some noble person. The mail may contain links which may be a phishing link, where the victim is asked to give details of his banking account which is later used by the fraudster for carrying out unlawful activities.

Cyber crimes against the intellectual property of individuals and organizations are also on the rise. Cyberspace with its attributes of offering anonymity and being borderless makes the tracing of crimes against intellectual property even more difficult. Lack of clarity on what is copyrighted and what is not adds to the difficulty of investigation and prosecution in intellectual property crimes. Blogging is a trend that has grown with the cyberspace. Many people express their ideas and views in blogs without being aware that any creative material or content is copyrightable in blogging. Users unaware of the Creative Commons License, which defines the
rights of uses (other than the creators or owners or authors of the content) to copy or share the blog content, may leave their creativity open for infringement.

There are acts in the cyberspace which result in the damage or loss of property of individuals and organizations. Viruses, Trojans and worms have always been a menace in the cyberspace. These are programs which when executed on computer systems can result in malfunctioning or complete failure of the systems. Information stored on the systems may be modified, deleted or even stolen by hackers and misused. These are easily transmitted over the network in the form of email attachments, pop-ups, banners, etc. Programs known as back-doors or trap doors may be installed on the systems to monitor the activities of the user. Key loggers are another set of applications which are commonly used by hackers. These tools monitor the keyboard of the systems and can capture each character type from the keyboard. Such tools are employed by hackers involved in financial crimes like online frauds, credit card frauds, to record the passwords and other credentials in order to use the data to carry out their fraudulent intentions. Children and adolescents are easy victims of pornographic crimes. They are lured by predators into viewing and forwarding objectionable materials leading to engaging in sexual activities and mental atrophy. Predators may pose as friends or relatives and victimize the child or teenager. The anonymity provided by the cyberspace acts as a shield for the violator. Cases like the Adnan murder case [2] expose the dangers of unsafe activities in social networking sites.

There are some categories of crimes which may be targeted against any individual irrespective of the age or gender of the victim. Intruders may gather personal information from social networking websites and may misuse the same. Photographs uploaded for sharing purposes may be morphed. Ignorance about the lurking dangers increases the vulnerability of the victims. Awareness should be created about the dangers lurking in the cyberspace and also on the safety measures to be adopted in order to use the technology for betterment.

Gaming portals host online casinos where gamers can play real-world casino games like Blackjack for huge sums of money. These portals offer no restriction on the basis of the age of the gamer. Hence even children are introduced to the act of gambling. The huge amount of money lures people to indulge in crimes like identity theft. Also online gambling and casinos may provoke people to carry out crimes like extortion and even murder.
The information technology and particularly the Internet is one of the revolutionary technologies witnessed by mankind but without proper regulations by authorities and precautionary measures by users, this technology may result in a Frankenstein’s monster. Hence it is the responsibility of the users to adopt safe methods of using this technology for development purposes, and law enforcement agencies should play an active part in curbing the unlawful and unethical activities in cyberspace.

References
Basic Fundae

Basic Data Structures

Dr. R. Manimegalai,
Professor, Department of Computer Science and Engineering,
PARK College of Engineering and Technology, Coimbatore -641 659.

Data structures is one of the important subject in Computer Science curriculum. One can expect at least half-a-dozen questions in data structures during a technical interview. Not only for job interviews, but for doing higher studies in any field related to computer science, through knowledge and understanding of data structures and computer architecture is essential. Data structure is a way of organizing data in a computer’s memory that considers not only the items stored, but also their relationship with each other. Advance knowledge about the relationship between data items allows designing of efficient algorithms for the manipulation of data.

In general, data structures can be classified mainly into two categories, namely, i) Linear Data Structure and ii) Non-linear Data Structure. A linear data structure traverses the data elements sequentially, in which only one data element can directly be reached and accessed. e.g. Arrays, Linked Lists, Stacks, Queues. In non-linear data structures, every data item is attached to several other data items based on specific relationships among them. The data items are not arranged in a sequential structure. e.g. Trees, Graphs. The following are the main operations that can be performed on the data structures:

- Creating the data structure newly
- Inserting an item into the data structure
- Deleting an item from the data structure
- Updating an item in the data structure
- Traversing the data structure by visiting all its elements
- Searching for an item in the data structure
- Printing all elements in the data structure
- Counting all elements in the data structure
- Other operations such as inversion, sorting, merging etc.
Data Structures are used to build high quality software with good scalability. Few areas in which data structures are used extensively are given below:

1) Compiler Design

- Hash Data Structure and Balanced binary tree structures are used to implement symbol table for storing information about symbols in lexical analysis phase
- Tree data structures are used to generate intermediate code representation during syntax analysis phase
- Stack data structure is used in the implementation of parser and semantic analyzer

2) Database Management System

- RDBMS uses Array Data Structure
- Network Data model uses Graph Data Structure
- Hierarchical data model uses Tree Data Structure

3) Operating System - Lists, Stacks and Queues are used in implementing Job scheduling algorithms, Memory allocation and several other tasks of OS

4) Various other fields such as Statistical analysis, Numerical Analysis, Digital Signal Processing, Artificial intelligence, Graphics, Simulation etc.

Though advanced data structures are used for building modern software applications, the following are considered to be basic data structures: arrays, lists, stacks, queues, trees and graphs. Both basic and advanced data structures are covered in several textbooks [1, 2, 3] of computer science curriculum. We believe that revisiting basics will definitely help students in understanding and enhancing their knowledge on these topics. In the last two issues (October 2013 and December 2013), basics and insertion into linked list are discussed. This issue discusses implementation of several other operations in linked list.
Deletion in Singly Linked List

There are three situations for Deleting element in list.
1. Deletion at beginning of the list.
2. Deletion at the middle of the list.
3. Deletion at the end of the list.

A sample linked list is shown in Figure 1. The Head pointer points to the first node in the list.

![Figure 1. Singly Linked List](image)

**Case 1 : Deletion at beginning of the list**

![Figure 2. Linked List of Figure 1 after Deleting the Node at the Beginning](image)

The algorithm for deletion at the beginning of the list is given below.

```c
void delete-first(node *Head) // Head points to the first node in the list
{
    node *temp = Head; // a temp pointer points to the first node
    Head = temp->next; // Head points to the second node, i.e. temp->next, in the list
    free (temp); //free the memory allocated to the first node which is pointed by temp
}
```

//end of the procedure delete-first
Case 2 : Deletion at the middle of the list

Fig 3. Linked List of Figure 1 after Deleting a Node in the Middle i.e. node with value 30

The algorithm for deletion at the middle of the list is given below.

```c
void * delete-middle(Node *Head, int key)
{ // Head points to the first node in the list and key is value stored in the node to be deleted
    Node *PrevNode,*CurrentNode;

    //Initially, both CurrentNode and PrevNode points to the first node in the list
    PrevNode = CurrentNode = Head;

    while (CurrentNode->data != key) //traverse the list till the node to be deleted is reached
        { 
            PrevNode = CurrentNode;    //remember the CurrentNode as PreviousNode
            CurrentNode = CurrentNode->next; //move to the next node in the list
        } //while loop is terminated when the node to be deleted is reached

    //CurrentNode points to the node to be deleted
    PrevNode->next = CurrentNode->next;
    //link field of PreviousNode points to the link field (i.e. next node) of CurrentNode

    free (CurrentNode); //free the memory allotted to the node deleted i.e. CurrentNode
}
```

Case 3 : Deletion at the end of the list

Figure 4. Linked List of Figure 1 after Deleting the Last Node in the List

The algorithm for deletion at the end of the list is given below.

```c
void * delete-last(Node *Head) // Head points to the first node in the list
{
    Node *PrevNode,*CurrentNode;
    //Initially, both CurrentNode and PrevNode points to the first node in the list
    PrevNode = CurrentNode = Head;

    while (CurrentNode->next != NULL) //traverse the list till the last node is reached
    {
        PrevNode=CurrentNode; //remember the CurrentNode as PreviousNode
        CurrentNode = CurrentNode->next; //move to the next node in the list
    } //while loop is terminated when the last node is reached

    //link of PreviousNode points to NULL, because PrevNode is the last node now
    PrevNode->next=NULL;

    // free the memory allocated to the last node which is pointed by CurrentNode
    free (CurrentNode);
} //end of procedure delete-last
```

It should be noted that all three cases, deletion at the front, middle and end of the linked list can be done using a single function instead of three different functions as discussed above. Writing a single function to handle all three cases of deletion in a singly linked list is left as an exercise to the readers. Apart from insertion and deletion, some of the popular operations in linked list are listed below:
• Searching for an element in the list
• Count the number of nodes in the list
• Remove duplicate elements in the list
• Merge two sorted lists as a single sorted list
• Reverse the list
• Given a key value, return the values stored at previous and next nodes in the list

Readers are encouraged to write algorithms for the above mentioned tasks. Variants of linked lists will be discussed in the next issue.

References:


---x---x---
Programming Tips

Test Your Skills in C
Compiled by
Mr. P. Kumar, Associate Professor,
Rajalakshmi Engineering College, Chennai.

1. printf("%d",printf("%d",100));
2. printf("%d",32768);
3. What is the output of the following:
   printf("%d %d", 72,072);
4. printf("%c",65+1);
5. main()
   {
   int a, b;
   a = -3 - -3;
   b = -3 - -(-3);
   printf("a=%d b=%d", a,b);
   }
6. main()
   {
   int x;
   x = 3**4 - 7^8;
   printf("x=%d",x);
   }
7. main()
   {
   float a;
   a=4/2;
   printf("%f %f ", a,4/2);
   }
8. int a=0;
   printf("%d %d %d ", a++, ++a, a);
   printf("%d", a);
9. int a=10,b=++a,c=++b;
   printf("%d",b);
10. int a=100,b=100,c;
    c=(a==100 || b>200);
    printf("%d",c);
11. int x=-4,y,z=10;
    y=x%-3;
    y=(y?0:z*z);
    printf("%d",y);
12. int c=0,d=5,e=10,a;
    a=c>1 ? d>1 || e>1 ? 100:200:300;
    printf("%d",a);
13. int x=10,y=20;
    x=!x;
    y=!x && !y;
    printf("%d %d",x,y);
14. int x=10,y;
    y=x>>2<<1;
15. printf("%d",11^5);
16. int x=3,z;
    z=+++x * +++x * ++x;
    printf("%d ",z);
17. int x=3,y=3,z=3;
    z=-x-- - --y;
18. int x,y,z;
    x=y=z=1;
    z=++x && ++y && ++z;
    printf("%d %d %d ",x,y,z);

19. int x=10,y;
    y=--x--;
    printf("%d %d ",x,y);

20. main()
    {
        main();
    }
1. **Project / Research Associate Positions at IIT Kharagpur**
   - Last date to apply: 7th – 22nd, January, 2014
   - For more details: [http://www.iitkgp.ac.in/topfiles/sric_job.php](http://www.iitkgp.ac.in/topfiles/sric_job.php)

2. **Student Program for Advancement in Research Knowledge (SPARK)**
   - SPARK is intended to provide a unique opportunity to bright and motivated students of reputed Universities to carry out their major project/thesis work and advance their research knowledge in mathematical modeling and simulation of complex systems.
   - Last date to apply: Throughout the Year
   - For more details contact: [http://www.cmmacs.ernet.in/spark/index.php](http://www.cmmacs.ernet.in/spark/index.php)

3. **Project / Research Associate Positions at IIT Delhi**
   - Last date to apply: 1st – 8th, January, 2014
   - For more details: [http://ird.iitd.ac.in/proj_positions](http://ird.iitd.ac.in/proj_positions)

4. **Post doctoral positions at IITs**
   - Last date to apply: Throughout the year
   - For more details:
     - [http://www.iitm.ac.in/content/post-doctoral-fellowship-iit-madras](http://www.iitm.ac.in/content/post-doctoral-fellowship-iit-madras)
     - [http://www.iitm.ac.in/content/women-post-doc](http://www.iitm.ac.in/content/women-post-doc)

---x---x---
1. Workshop on Swarm Robotics

Date and Venue: 4th - 5th January, 2014; IIT Bombay
More details can be found at: http://www.techfest.org/home/event/swarm

2. Workshop on Android Application Development and Web Development

More details can be found at: http://www.techfest.org/home/event/android
http://www.techfest.org/home/event/web

3. IEEE Students' Technology Symposium-2014

More details can be found at: http://ewh.ieee.org/sb/kharagpur/iit/TechSym2014/

4. Workshop on Embedded and Reconfigurable

Date and Venue: 6th - 10th January 2014; IIT Kharagpur.
More details can be found at: http://www.iitkgp.ac.in/downloads/atdc_workshop.pdf

5. Eighth International Workshop on Algorithms and Computation (WALCOM 2014)

More details can be found at: http://walcom2014.iitm.ac.in/

5. Science and Technology Studies Conference

Date and Venue: 2nd, 21st January and 5th February, 2014, IIT Madras.
More details can be found at: http://www.hss.iitm.ac.in/wipmitepsi/sci_tech_conf.html
Fun Corner

How Projects Really Work (v 5.5)

- How the customer explained it
- How the project leader understood it
- How the analyst designed it
- How the programmer wrote it
- What the beta testers received
- How the business consultant described it
- How the project was documented
- What operations installed
- How the customer was billed
- How it was supported
- What marketing advertised
- What the customer really needed

why does it never say "Good command" or "Excellent file name"?

> Bad command
January 2014

```
"SORRY, WE CAN'T E-MAIL YOUR PIZZA AS ATTACHMENT."
```

```
RAT TRAP
LOOK, CHEESE!
```

```
HUMAN TRAP
LOOK, AN INTERNET CONNECTION!
```
Video Track

Assembling a PC
Parts list: Hard Disk, RAM, Wireless MODEM, Wireless NIC, DVD-ROM, Battery
Click this link to watch the video on how to assemble a Personal Computer:
http://www.youtube.com/watch?v=D_E3ULURHkE

iPhone Programming Tutorial
It describes the fundamental architecture of iOS apps, including how the code you write fits together with the code provided by iOS. Objective-C is the primary programming language we use when writing software for OS X and iOS. It’s a superset of the C programming language and provides object-oriented capabilities and a dynamic runtime.
Click this link to watch the video: http://www.youtube.com/watch?v=_Qn-JUtQrsM

Pervasive computing
Pervasive computing (also called ubiquitous computing) is the growing trend towards embedding microprocessors in everyday objects so they can communicate information. The words pervasive and ubiquitous mean "existing everywhere."
Click this link to watch the video:
http://freevideolectures.com/Course/2341/Embedded-Systems/37

LAN network Formation
Parts List: Switches, router, server
Click this link to watch the video on how to form a LAN Network:
http://www.youtube.com/watch?v=_u3hNRZWMcc
(Naye) नए Gadgets

**Oculus Rift**

Virtual Reality gaming is here in the form of Oculus Rift. This history-defining 3D headset lets you mentally feel that you are actually inside a video game. In the Rift’s virtual world, you could turn your head around with ultra-low latency to view the world in high resolution display. The timing is perfect as the world is currently bombarded with the virtual reality topic that could also be attributed to Sword Art Online, the anime series featuring the characters playing games in an entirely virtual world. More details can be found in the following link: [http://www.oculusvr.com/](http://www.oculusvr.com/)

**Belkin Super Speed USB 3.0 4-port Hub**

At 10 times faster than USB 2.0, USB 3.0 is excellent for data transfers from external storage drives or USB flash drives. Unfortunately, many laptops and PCs still don’t offer as many USB 3.0 ports as we would like, forcing users to compromise. As its name suggests, the Belkin SuperSpeed USB 3.0 4-Port Hub plugs into an existing USB 3.0 port to increase the number of USB 3.0 ports that are available. While not all devices can run at the full speed simultaneously, having the hub around certainly eliminates the hassle of insufficient USB ports. More details can be found in the following link: [http://www.belkin.com/us/p/P-F4U058/](http://www.belkin.com/us/p/P-F4U058/)
Doxie One

The Doxie One is a scanner designed to scan all your paper, photos and receipts without the need for a computer. Its compact form factor allows the scanner to be stowed away in a drawer, and setup is quick: You just plug it into a wall socket. Unlike a bulky traditional flatbed scanner, an automatic feeder starts automatically and pulls the sheet through in seconds. Captured images are saved on an included SD memory card, much like in a digital camera. This can then be loaded onto a Mac or PC through a standard flash memory card reader, or to an iPad tablet with Apple’s iPad SD Card Reader. More details can be found in the following link: [http://www.getdoxie.com/](http://www.getdoxie.com/)

Google Chromecast

The Google Chromecast is a media streamer that plugs into any HDTV with an HDMI port. Similar to the Apple TV, the Chromecast connects to a Wi-Fi network for wireless streaming. To be clear, support for the Chromecast must be specifically built into apps, though this shouldn’t be an issue as Google has already released the API for the device. More details can be found in the following link: [http://www.google.co.in/intl/en/chrome/devices/chromecast/](http://www.google.co.in/intl/en/chrome/devices/chromecast/)
IDAPT i4 Universal Charger

The IDAPT i4 is an innovative universal charger designed to charge up to four mobile devices simultaneously. This docking station comes with three receptacles that accept various charging tips ranging from mini USB, micro USB, Lightning, the old Apple Universal Dock, and other tips for various digital cameras. A separate USB port offers the ability to plug in a standard USB cable for charging tablets or other devices that may be heavy or bulky. More details can be found in the following link: [http://www.idaptweb.com/universal_chargers/i4/](http://www.idaptweb.com/universal_chargers/i4/)

LX Desk Mount LCD Arm

The Ergotron LX Desk Mount LCD Arm sets the gold standard for monitor arms on the desktop. Perfect for both single monitor users and those who use multiple monitors on their desktop, the Ergotron monitor arm offers unparalleled flexibility in the positioning of your LCD monitors. Moreover, it frees up space on the desktop as it mounts onto the edge of the desk, and can be pushed out of the way. More details can be found in the following link: [http://www.ergotron.com/tabid/65/PRDID/351/language/en-US/default.aspx](http://www.ergotron.com/tabid/65/PRDID/351/language/en-US/default.aspx)
Kensington Absolute Power Laptop, Phone, Tablet Charger

The Kensington Absolute Power Laptop, Phone, Tablet Charger is a highly versatile laptop charger that delivers up to 100 watts of power to charge your laptop, as well as two separate USB devices – simultaneously. The Kensington Absolute Power serves as an excellent second charger for laptop users, and its compact form factor means that it is one of the most powerful chargers in its class. More details can be found in the following link:
(Savaal) सवाल  Time

Answer the following questions and win attractive prizes for the first 5 correct entries. Send your answers to the following email-id: whizkidd.csi@gmail.com

1. Who shared the Turing award along with Dr. D. Raj Reddy during 1994? What is the Contribution?

2. Turing award in 1986 was given to ……………… and ………………………………

3. Turing award in 2006 was given to ………………… for ………………………………

4. Match the following:

   A) Donald E. Knuth -  i) EDSAC
   B) Edsger W. Dijkstra -  ii) Computer programming and Compiler construction
   C) Marvin Minsky -  iii) The Art of Computer Programming
   D) Maurice Wilkes -  iv) ALGOL
   E) Alan J. Perlis -  v) Artificial Intelligence

5. What is the basic operation in a sorting algorithm?

6. What are the timing complexities of iterative and recursive versions of Sum-of-N-numbers problem?

---x---x---