

B.Tech.
First Semester Examination
Fundamentals of Computers & Programming in C
(CSE-101F)

Note : Attempt **any** five questions.

Q. 1. (a) What do you mean by cache memory ? Explain how data is written into cache memory ?

Ans. The word cache is pronounced as cash. The cache memory is placed in between CPU and main memory. The processor is connected to the cache memory through a cache controller. It is a semiconductor memory. It consists of static RAMs. Its access time is about 10 nano second. 1 nanosecond = 10^{-9} second, which is much less than that of the main memory. The access time of the main memory is about 50 nanosecond. The capacity of the cache memory is 2 to 3 percent of that of the main memory. It stores instruction codes & data, which are to be currently executed by the CPU. It is used to reduce the average access time for instructions and data, which are normally stored in the main memory. A cache memory also needs a cache controller. Cache controller ICs are available.

There are two types of Cache Schemes: write through and write back. In a write through cache the main memory is updated each time the CPU writes into the cache. The advantage of the write through cache is that the main memory always contains the same data as the cache contains. In a write-back cache, only the cache memory is updated during a write operation. The updated locations in the cache are marked by flags so that later on where the word is removed from the cache, it is copied into the main memory. If CPU waits for write operation of the main memory, it is slowed down. Moreover, the CPU does not need the result of the write operation immediately. Therefore, it is not necessary for the CPU to wait for the write operation to be completed. Hence, to improve performance a write buffer can be included for temporary storage for write requests. The CPU keeps each write request into this buffer and executes the next instruction. The information from the write buffer is sent to the main memory whenever the memory is not responding to read requests.

The technique of access a cache memory differs from that of the main memory. To access main memory the CPU sends an address to it. In response of this the main memory sends contained at the specified memory address. On the other hand, cache memory uses parallel searching of the required data. It first compares the incoming address to the addresses present in the cache. If the address matches, it is said that a 'hit' has occurred. Then the corresponding data is read by the CPU. If the address does not match, it is said that a 'miss' has occurred. When a miss occurs, the data is read from the main memory. The data read from the main memory is also written to the cache memory, so that when this specific address is accessed next time a hit occurs.

Q. 1. (b) Explain the following codes, used to represent information inside a computer:

(i) Cray Code

(ii) ASCII Code

Ans. (i) Gray Code: The Gray code is binary code which is shown in table. It is used in shaft encoder which indicates the angular position of a shaft in digital form. The binary bits are arranged in such a way that only one binary bit changes at a time when we make a change from any number to the next. Its use reduces the error in reading shaft position. The largest possible error will be one least significant digit. Suppose that the shaft changes its position from 7 to 8, gray code will change from 0100 to 1100. If the

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binary bit is not picked up by the sensor, the encoder, will show the previous position that is 7. The Gray code is often used in computer controlled machines such as lathes etc. Photo electric codes or shaft position encoder disks are used as sensors.

Decimal	Gray Code	Decimal	Gray Code
0	0000	9	1101
1	0001	10	1111
2	0011	11	1110
3	0010	12	1010
4	0110	13	1011
5	0111	14	1001
6	0101	15	1000
7	0100		
8	1100		

(ii) **ASCII Code** : ASCII is pronounced as "ask-ee". It stands for "American standard code for Information Interchange. ASCII code is used extensively in small computers peripherals, instruments and communication devices. It is a 7-bit code. Micro computer using 8-bit word length use 7 bits to represent the basic code. The 8th bit is used for parity or it may be permanently 1 or 0. With 7 bits up to 128 characters can be coded.

It includes upper and lower case alphabets, numbers, special symbols and control characters etc.

Characters	ASCII (7-bit) Code	Character	ASCII (7-bit)
	21	:	:
;	22	x	78
:	:	y	79
:	:	z	7A
(28	A	41
)	29	B	42
*	2A	:	:
:	:	:	:
:	:	J	4A
-	5F	K	4B
{	7B	:	:
}	7D	:	:
DEL	7F	0	30
a	61	1	31
b	62	:	:
		:	:
		8	38
		9	39

Q. 2. (a) Explain the booting process sequentially ? Differentiate between cold and warm booting.

Ans. "**Bootting is the process of loading one operating system into a computer's main memory**".

When we switch on the computer, operating system or a part of it is loaded **into** the **main memory** of the computer system. Part of the O.S. is stored in secondary memory on a floppy disk, **hard disk or** magnetic tape, while part of it is stored permanently in ROM (Read Only Memory). Where the **computer** is first started, it automatically starts to execute a program stored in the O.S. portion of **ROM**. **This** program reads part of the O.S. in RAM and the computer begins to execute this part of the system.

Three files namely IO.SYS, MSDOS.SYS and COMMAND.COM must be loaded into the **main** memory for the working of the computer. Booting means readiness of the computer to accept commands from the user. This process is explained below:

(i) The POST (Power On Self Test) takes place. When we switch on the system, for checking **the** integrity of all parts. If any part is not present or faulty an error message is displayed.

(ii) A chip called ROM-BIOS (Read Only Memory Basic Input Output Services) is read **and** executed. After this a check for the presence of DOS files is performed in the order given below:

(a) First drive A is checked and if DOS files are present, DOS is loaded.

(b) Secondly drive C is checked for DOS, if present, DOS is loaded.

(c) Following error message is displayed on the monitor

Non-system disk or disk error

Replace & press any key when ready

(iii) In case, DOS files are found in a drive, its very first sector (boot sector) is read which **stores a** small program known as bootstrap loader.

The bootstrap loader is then brought into the main memory and its instructions are executed as follows:

(a) Firstly file IO.SYS and then file MSDOS.SYS is loaded and certain tables are initialised.

(b) File CONFIG.SYS is reached for certain configurations to set up initially.

(c) File COMMAND.COM is brought in the main memory.

(d) Batch file AUTOEXEC.BAT is executed.

(e) Finally, DOS prompt appears showing drive letter from which the DOS has been loaded i.e., either A > or C > .

When we power up a computer by turning on the power "on" switch,, it is called a cold boot. If **the** computer is already boot on and we restart it, this is called a warm boot or a warm start (by simultaneously pressing the Ctrl + Alt + Del keys or pressing the Reset button on the computer). Normally, your computer would boot from the hard drive, but if that drive is damaged you can use a **floppy** disk called boot disk to start up your computer.

Q. 2. (b) What are various functions of an Operating System ? Briefly explain.

Ans. Functions of An Operating Systems :

An operating system performs the following functions:

(i) Starting the computer.

(ii) Automatic sequencing of jobs.

(iii) Performing input/output operations and handling of interrupts.

(iv) Handling of errors in case of abnormal termination.

- (v) Scheduling of jobs.
- (vi) Allocation and control of resources.
- (vii) Provide protection to jobs and to operating system.
- (viii) Provide user friendly interface.
- (xi) Perform accounting of the resource used by the user program.

A computer system consists of resources like processors, memories, channels, input-output devices, program and data. Hence an O.S. can be regarded as a resource manager.

As a resource manager, the operating system must perform the following functions for each resource:

- (i) Keep track of the status of each resource.
- (ii) Decide which job should get the resource and how much time according to same policy.
- (iii) Allocate the resource to the job as decided in (ii).
- (iv) After the resource is used by the job for the allocated time, make the resource free.

Q.3.(a) Briefly explain the following:

- | | |
|--------------|--------------------|
| (i) Modem | (ii) Router |
| (iii) Switch | (iv) ISP |

Ans. (i) **Modem** : Modem is a device which is used to modulate and demodulate the signal. It is a serial port device which accept serial bits as input and produce modulated carrier signal as output, so it is called modem. It is used between computers and telephone lines. Computer process digital signal and telephone process the analog signal. Modem is used to communicate over telephones lines. It is used modulate and demodulate the signal. This function is translation of digital computer data into signal that can be transmitted over a phone line and vice-versa.

Modems over a phone line and vice-versa modems are different type according to transmission technique:

- (i) Line type
- (ii) Operation mode
- (iii) Synchronization
- (iv) Modulation
- (v) Baud rate
- (vi) Transmission media.

(ii) **Router**: It is a special hardware device connect two or more dissimilar LAN to form a WAN. Routers have an intelligent behaviour in all to send packets via correct path to reach the destination. It operate at network model of OSI model. Routing have algorithms to calculate best suited path for packet transmission over the network. In large network there are multiple paths available so routers required. Router is a specialized computer used to send messages from one source to **another destination after** decided the shortest route is also control the congestion in the network it is a main device in large network to move over the data over the network. Routers can pass packets between networks that use similar protocols mean the computers which use TCP/IP protocols can interact with other one.

- (i) A router operate on network layer of OSI model.
- (ii) Router support algorithms.

(iii) It is multiport device with high speed back bone.

(iii) Switch: A switch is a network device that selects a path or circuits for sending a unit of data to its next destination. A switch may also include the function of routers, a device or program that can determine the route and specially what adjacent network point the data should be sent to. In general a switch is a simpler and faster mechanism than a router, which requires knowledge about the network and how to determine the route.

(iv) ISP : ISP stands for Internet Service Providers, it is a business that sells computer access to the internet. To connect to the internet via ISP (i) Modems (ii) Telephone line (iii) Computer with TCP/IP network software equipments are used initially VSNL was the only ISP in India but as surfing the internet became popular. The registration firms are available on the internet itself on the website of the ISPs. An ISP subscribes with access to the internet for a fee. A Pop is like a telephone company's switching office, where all of the ISP's equipment and personnel are located. Many business owners are already familiar with ISPs because they have access to the internet at home.

Q.3(b) What do you mean by web browser ? Name any three browsers.

Ans. Web Browser: A browser is an application that knows how to interpret and display documents that it finds on the www. Documents of www are hypertext documents. Hypertext documents are not a plain text. They contain commands that structure the text by item. Browser can access multiple protocols and hypermedia information meaning that they give access to other internet services such as electronic mail, FTP, usenet, and telnet.

In addition to displaying nicely formatted text, browser can also give the ability to access the documents that contain other media besides text. For example, if you have a sound card in your Pc, you can hear sound clips that included in www documents.

Three Types of Browser: (i) Microsoft (ii) Internet Explorer (iii) Netscape Explorer

Q.3(c) Briefly discuss www and **FTP**.

Ans. www : Stands for world wide web. It is hypertext information and communication system popularly used on the internet computer network, with data communication, web is basically made up of what is called pages-hundreds of thousands of pages, all over the internet each page has a connection to other pages. World wide web is connected by hypertext so information presented on the web need not be constrained to a linear form. The web is a directed graph in which nodes are connected by edge. The history of www was started in 1989 at CERN. By the end of 1990, the researchers at CERN had a text mode browser and graphical browser for Next computers.

FTP: File Transfer Protocol is one of the first developed internet services which allow users to move files from one place to another. The FTP service allows the users to copy files from one computer to another. It is a client/server application. The client is a local Host and server is called a Remote Host. The administrator of the machine must set up this server and the administrator decides which files and services are made available through the FTP server.

Q. 4. (a) Write some characteristics of a good programming language.

Ans. Characteristics of a Good Programming Language:

The guidelines for a good programming style are given below :

(i) Identifier Names: The names of identifiers in a program should be so chosen that they suggest the purpose of the identifiers in the program. This activity is known as self documentation.

Example:

Total marks = sub1 + sub2 + sub3 + sub4

AreaofTriangle = (Base + height)/2;

(ii) **Function** : The names of functions can also be picked in accordance with their expected objectives. e.g.,

read_mat (...)

mat_tadd (...)

mat_mult (...)

print mat (...)

(iii) **Commenting and Indenting** : Informative comments should be included in a program at important places such as :

(i) At the beginning of the programme.

(ii) At the beginning of procedures and functions.

(iii) A distinction between global variables and local variables should be clearly indicated.

The general guidelines for indenting of statements are given below:

(i) One instruction must be written in one line.

(ii) The braces pair { and } should be written in the same column. This activity helps in proper matching of { - } pairs.

```
{
    {
        {
            }
        }
    }
}
```

(iii) Variables of same type can be defined in one line.

(iv) **All** constants should be **defined in separate line**.

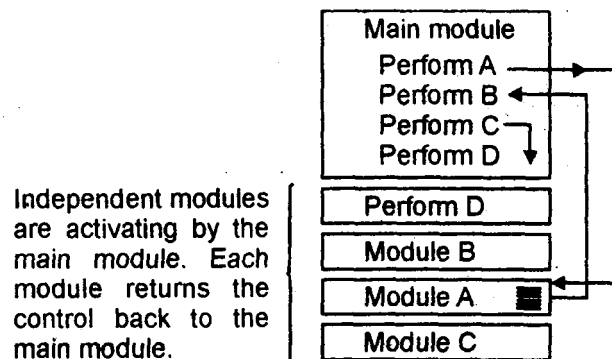
(v) The compound statements with in { - } pair should be indented 5 places.

Q. 4. (b) Explain the following programming methods:

(i) Modular Programming,

(ii) Structured Programming

Ans. Modular Programming : Breaking down of a problem into smaller independent pieces (modules) helps us to focus on a particular module of the problem more easily without worrying about the entire problem. No processing outside the module should affect the processing inside the module. It should have only one entry point and one exit point. We can easily modify a module without affecting the other modules. Using this approach the writing, debugging and testing of programs becomes easier than a monolithic program. A modular program is readable and easily modifiable. Once we have checked that all the modules are working properly, these are linked together by writing the main module. The main module activates the various modules in a predetermined order.



(ii) Structured Programming: The main objectives of structured programming are:

- Readability
- Clarity of programs
- Easy modification
- Reduced testing problems

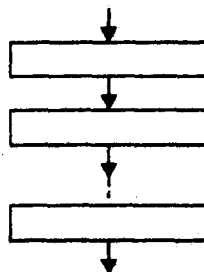
The three basic building blocks for writing structured programs are given below:

(i) Sequence structure

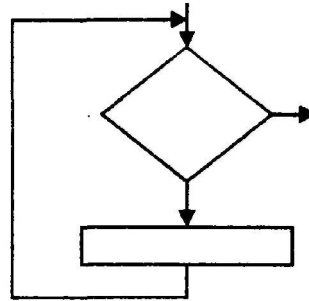
(ii) Loop or iteration

(iii) Binary Decision Structure

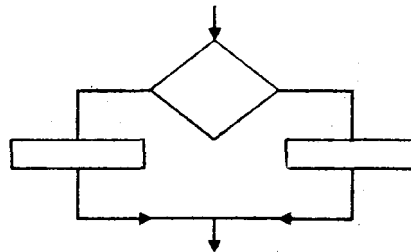
(i) Sequence **Structure** : It consists of a single statement or a sequence of statement with a single entry and single exit.



(ii) Loop or Iteration : It consists of a condition (simple or compound) and a sequence structure which is executed condition based.



(Hi) Binary Decision Structure: It consists of a condition (Simple or compound) and two branches out of which one is to be followed depending on the condition being true or false.



Q. 5. tai Write a program in C that reads two integer A and B & prints their exchanged values.

Ans (i) /*WAP that reads two integer A and B & print their exchanged values*/ (using another variables)

```

#include < stdio.h >
#include < conio.h >
voide main ()
{
    int A, B, temp;
    printf("enter the values of A & B");
    scanf("%d%d", & A, & B);
    temp = A;
    A = B;
    B =temp;
    printf("swapped values are %d% and %d'", A, B);
    getch();
}
  
```

(ii) Exchanging the Values (without use of third variable)

```

#include < stdio.h >
# include < conio.h >
void main ()
{
    int A, B;
  
```



```

scanf("%d %d", &A, &B);
    A = A + B;
    B = A - B;
    A = A - B;
printf("swapped values are %d and %d",A,B);
getch ();
}

```

Q. 5. (b) What is mean by back slash characters ? What is their utility in a program ?

Ans. Back Slash **Character** : These cahraacter constants represent one character, although they consist of two characters. These are also known as escape sequences. These are interpreted at execution lime. The values of these characters are implementation defined

'C' uses some characters such as line feed, form feed, tab, newlines etc. through execution characters i.e., which cannot be printed or display directly. The following table shows some of the escape sequence character or back slash character constants.

Escape Sequence	Meaning	Execution times result
'\0'	End of string	Null.
'\n'	End of line	Takes the control of next line.
'\r'	Carriage return	Takes the control to next paragraph.
'\f'	Form feed	Takes the control to next logical page.
'\t'	Horizontal tab	Takes the control to next horizontal tabulation position.
'\''	Back slash	Presents with a backslash.
'\a'	Alert	Provides an audible alert.
'\"'	Double quote	Presents with a double quote.

Q. 6. (a) Define enumerated data type ? Show with some example.

Ans. **Enumerated Data Type** : 'C' provides user-defined data type known a "enumerated data type". It attaches names to numbers, thereby increases the readability of the program. It is generally used when we known in advance the finite set of values that a data type can take on.

The syntax for enumerated data type is given below:

```
enum identifier {val 1,val 2,....., val n};
```

Here, identifier represents the user defined enumerated type & val 1, val 2, ... val n are called members or enumerators.

Example:

```
enum months {Jan, Feb, Mar, Apr, May, June, July, Aug, Sep., Oct, Nov, Dec};
```

```
enum months month1, month 2; /*variables declared of type months*/
```

Enumerated means that all values are listed. The enumerators are automatically assigned values starting from 0 to n-1. Thus, the first value Jan. will have 0, the second value Feb will have value 1" and so on.

Q. 6. (b) What is conditional Compilation ? How it is useful ?

Ans. The #if def#else#endif directive allows us to skip part of the source code. The general form of this preprocessor directive is

```
#if def macro name
    statement1;
#else
    statement2;
#endif
```

In case we have used #define for macroname then statement 1 will be computed otherwise statement 2.

This compilation is known as conditional compilation through this the programs can be made portable (a program which can run of different type of computers without or with little modification).

Q. 6. (c) Write a function sub-program in C that will generate the mirror image of a number i.e., if the DO. is 47325 then the function should print 52374.

Ans. /*Find the reverse of a given number using function*/

```
#include < stdio.h >
#include < conio.h >
void main ()
{
    int revnum (long int n); /*function prototype*/
    long int num;
    int rev;
    clrscrQ;
    printf ("enter the number \n");
    scanf ("%d", & num);
    rev = revnum (num);
    printf("\n reverse of number of %d is %d \n", num, rev);
}
/* function definition revnum ()*/
int revnum (long int n)
{
    int r;
    do
    {
        r = n %\0;
        printf("%d", r);
        n/ = \0;
    } while (n! = 0);
}
```

Q. 7. (a) Write a program in C that creates a File called "Student" and writes the records of all the students in the class into the file.

```

Ans. /* create a file which will store students records*/
#include <stdio.h>
main ()
{
    FILE*fptr;
    struct student
    {
        char name[21];
        int roll no;
        int marks[5];
        int total;
    };

    struct student stud; /*structure variable declared*/
    int i, n, j, size;
    char target [13], ch;
    clrscr( );
    printf("enter the name of file to be created:");
    gets (target);
    fptr = f open (target,"w"); /*open file in output mode*/
    if (!fptr)
        printf("\n can't open target file for writing \n");
    else
    {
        size = si/eof(stud); /*find the size of structure*/
        printf("\n How many students are there ? \n");
        scanf("%d", &n);
        for (i = 1; i<=n; i++)
        {
            fflush (stdin); /* empty the input buffer*/
            printf("\n Enter the name of student:%d\n",i);
            gets(stud.name);
            printf("\n Enter the rollno");
            scanf("%d", & stud.roll_no);
            printf("\n Enter the marks in five subjects:");
            for(j=0;j<5;j++)
                scanf("%d", & stud.marks[j]);
            stud.total = 0;

            /*computer the total*/
            for(j = 0;j<5; j++)
                stud.total + = stud. marks[j];

            /*write to file*/
            fwrite(&stud, size, 1, fptr);
        }
    }
}

```

```

        fclose(fp); /*close file*/
    }
}

```

Q. 7. (b) **What** are **different** methods of opening

Ans. A data file must be opened before it can created or processed. The filename is associated with the buffer area or the stream. The mode of file utilization i.e., read only, write only or read/write both is also specified while opening the data file. The syntax of library function 'fopen()' used to open a file is given below:

```

fp = fopen("filename", "mode");

```

Here, filename represents the name of the data file a mode specifies the purpose of opening a file. The filename must be in accordance with the rules for naming files, as per the O.S. in use.

The fopen() function returns a pointer to the beginning of the buffer area associated with the file; other wise a NULL value is returned which is defined in 'stdio.h'.

```

#include <stdio.h>
main ( )
{
    FILE* fp;
    fp = fopen ("TEXT.DAT", "w");
    if (!fp)
        printf("\n can't open file for writing \n");
    else
    {

        fclose(fp);

    }
}

```

fopen () : Creates a new file or opens an existing file for use.

Q.8. Briefly discuss the following:

- (a) Macro,
- (b) Debugger
- (c) Abstract **data types**,
- (d) **TCP/IP**

Ans. (a) Macro: If a sequence of instruction is used frequently in a program, it will be convenient for the programmer to assign a name to the sequence. Some assemblers have facility to assign a name to a sequence of instructions. The sequence of instructions to which a name is assigned is called a macro.

Once a sequence of instructions is written and a macro name is assigned to it, the assigned macro name will be used in the program whenever needed instead of writing the sequence over & over again.

Example:

```
COMP 2    MACRO                ADDRESS
          LDA                   ADDRESS
          CMA
          ADI                   01
          ENDM
```

Here COMP 2 is the name of the macro. The word MACRO is to be written in the beginning of the definition. ADDRESS is a parameter. ENDM is used to end a macro.

(b) **Debugger** : In computer's terminology the words bugs means errors. To debug means to eliminate program errors. Debugger is a program that helps in finding and correcting error's in user's programs. The program debugging and testing are also called verification and validation respectively.

A debugger allows to execute a single statement or a single section of a program at a time. After the execution of a statement or a section of the program, the values of the variables, the contents of registers or the code that has just been executed or is about to be executed can be displayed. It also allows to insert break points.

Programs need through debugging and testing before they are used. There are a number of tool to debug programs.

- (i) Simulators
- (ii) Logic analyzers
- (iii) Break points
- (iv) Trace routines
- (v) Memory dumps etc.

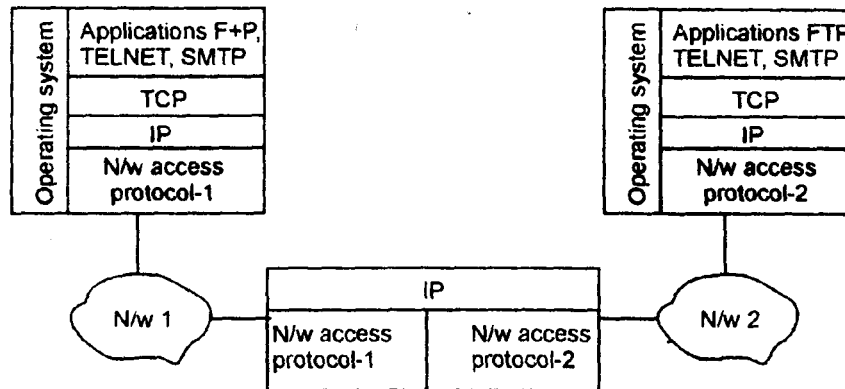
(c) **Abstract Data Types** : An abstract data type could be defined as mathematical model with a collection of operations defined on it. A simple example is the set of integers together which the Operations of union, intersection defined on the set.

The ADTs are generalization of primitive data types (integer,char etc.) and they encapsulates a data type in the sense that the definition of the type and all operations on that type localized to one section of the program. They are treated as a primitive data type outside the section in which the ADT and its operations are defined.

An implementation of an ADT is the translation into statements of a programming language of the declaration that defines a variable to be of that ADT, plus a procedure in that language for each operation of the ADT. The implementation of the ADT chooses a data structure to represent the ADT.

(d) **TCP/IP**: The internet is a network of networks consisting of thousands of networks spanning the entire globe. It uses TCP/IP based communication architecture to interconnect different type of LANs. The TCP/IP architecture consists of five core protocols. This family of protocols is known as "Internet protocol suite". TCP and IP are two most common protocols of this suite.

(i) **IP (Internet Protocol)** : This is a protocol used by the internet for transferring messages from one machine to another. The messages are sent in the form of packets. Each packet consists of 1500, or



fewer bytes. Thus, IP, uses packet switching to connect multiple LANs within the same building or at different sites.

This protocol identifies each network and each computer by a unique fixed address (32 bit). This address is used by IP to determine the source and destination of a packet

(ii) **TCP** : The TCP provides the logic for ensuring the reliable delivery of data to be exchanged between the host systems. It collects the related packets of a message or of blocks of data and places them in proper order. It also checks the validity of the packets. Thus, it keeps track of the blocks of data to ensure reliable delivery to the appropriate application.