I Semester Diploma Examination, August- 2021
FUNDAMENTALS OF COMPUTER
SCHEME OF VALUATION
Section-I

1. (a) Convert the following:
(i) & (ii) Conversion- Working steps + Result

2 X (2M+1M) = 3M

(b) Expression in respective required form- Working steps + Result.

3X2M = 6M

(c) Binary equivalent ASCII code for given word- Method of decoding + Result.

2*(2+2) = 8M

2. (a) Each universal gate with Explanation + Symbol +Expression + Truth table

2*(1+1+1+1) = 8M

(b) Develop a truth table for 3 input AND gate- Valid Input sequence + Output.

6 + 2 = 8M

(c) Determine when the outputs for XOR and XNOR logic gates are high-
Truth table / Brief description.

2*2 = 4M

Section- II

3. (a) Apply Boolean algebra rules/laws and prove,
(i) (A+B) (A+C) = A +BC
(ii) AB + A (B+C) + B (B+C) = B +AC

Proof: Application of relevant laws/rules- 5M each

(b) Design a full adder circuit with truth table- Circuit Diagram + Truth table

3 + 3 = 6M

(c) Implement a comparator using logic gates- Diagram

4M

4. (a) Define and explain 4 : 1 multiplexer- Definition + Explanation +Figure + Truth table

2 + 2 + 3 + 3 = 10M

(b) Explain the construction of 4 bit synchronous counter with Truth table.

Explanation +Figure +Truth table
3 + 4 + 3 = 10M

Section- III

5. (a) List different types of flip flops- Any four.

4M

(b) Describe J K Flip-flop working with a diagram- Diagram + Explanation.

3 + 3 = 6M

(c) Construct 4-bit SISO shift register & explain its working- Diagram + Explanation.

4 + 4 = 8M

(d) List applications of counter. Any Two.

2M

6. (a) Classify computers based on purpose and size- Classification based on Purpose + Size

2+3M

(b) Distinguish between system software and application software- Any two features.

2x2.5M

(c) Describe working of a keyboard- Diagram + Explanation

4 + 6 = 10M

Section- IV

7. (a) Explain computer Network categories

Explanation 3 categories 5marks

(b) Describe online data processing method- Explanation

5M

(c) Explain functional units of computer with diagram- Figure + Explanation

4 + 6 = 10M

8. (a) Discuss Auxiliary memory- Explanation

5M

(b) Explain Cache memory- Explanation

5M(Only diagram - 2M)

(c) Classify computers based on Flyns classification- Diagram representation + 4 Statement

1 + (4*1) = 5M

(d) Explain BIOS- Explanation

5M

Section- V

9. (a) Differentiate the following:

(i) Multitasking Operating System and Multiprocessing operating system.

Any 3 difference 5M

(ii) Real time operating system and Batch processing operating system.

Any 3 difference 5M

(b) Write an algorithm for area of circle. Read + Process + Write + Begin & End Format

1 + 1 + 1 + 2 = 5M

(c) Draw flowchart to accept the length of two different line segments and check whether they are equal or unequal. Display the message accordingly- **Correct symbols + flowchart**

2 + 3 = 5M

10. (a) Explain generation of programming language. Give example for each- Each generation with an example

2 * 5 = 10M

(b) Define variable. Specify the rules for naming a variable. Give examples- Definition + Rules + Example

2 + 6 + 2 = 10M

I Semester Diploma Examination, August- 2021

FUNDAMENTALS OF COMPUTER

Model Answers

Section-I

1. (a) Convert the following:

(i) Binary number 11011 to decimal number.

$11011_2 = 1 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 = 16 + 8 + 0 + 2 + 1 = 27_{10}$

(ii) Decimal number 497 to Octal number.

$497_{10} = 761_8$

497 ÷ 8

62 ÷ 8 - remainder is **1**

7 ÷ 8 - remainder is **6**

0 ÷ 8 - remainder is **7**

(b) **Express the decimal number (-47) in 8 bit binary form of**

$47_{10} = 0010\ 1111_2$

(i) Sign – Magnitude form = 1010 1111

(ii) 1's complement form = 1101 0000

(iii) 2's complement form = 11010001

(c) **Write Binary equivalent ASCII code for the words**

(i) CART - 1000011 1000001 1010010 1010100

(ii) blue - 1100010 1101100 1110101 1100101

2. (a) Explain the universal gates with logic symbol, expressions, truth table.

NAND Gate: The NAND gate represents the complement of the AND operation. Its name is an abbreviation of NOT AND. The symbol for the NAND gate consists of an AND symbol with a bubble on the output, denoting that a complement operation is performed on the output of the AND gate. The truth table and the graphic symbol of NAND gate is shown in the figure

Inputs		Output
A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

NOR gate represents the complement of the OR operation. Its name is an abbreviation of NOT OR. The graphic symbol for the NOR gate consists of an OR symbol with a bubble on the output, denoting that a complement operation is performed on the output of the OR gate.

Expression is $Y = \overline{A + B}$.

inputs		output
A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

(b) Develop a truth table for 3 input AND gate.

3 Input AND Gate Truth Table

Inputs			Outputs
A	B	C	X
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

(c) Determine when the outputs for XOR and XNOR logic gates are high.

A	B	Q
0	0	0
0	1	1
1	0	1
1	1	0

XOR

A	B	Q
0	0	1
0	1	0
1	0	0
1	1	1

XNOR

In XOR, the outputs are high if the inputs are different; When the all inputs are same/equal, the output remains low.

In XNOR, the outputs are high if the inputs are same/equal; when inputs are discrete, the output remains low.

Section- II

3. (a) Apply Boolean algebra rules/laws and prove,

(i) (A+B) (A+C) = A +BC

(A+B) (A+C) = AA + AB + AC + BC (A.A = A)

= A+ AB + AC + BC

= A(1+B+C) + BC (A + 1 = 1)

= A.1 + BC (A.1 = A)

= A + BC

(ii) AB + A (B+C) + B (B+C) = B +AC

AB + A (B+C) + B (B+C) = AB + AB + AC + BB + BC (A+A = A, A.A = A)

= AB + AC + B +BC

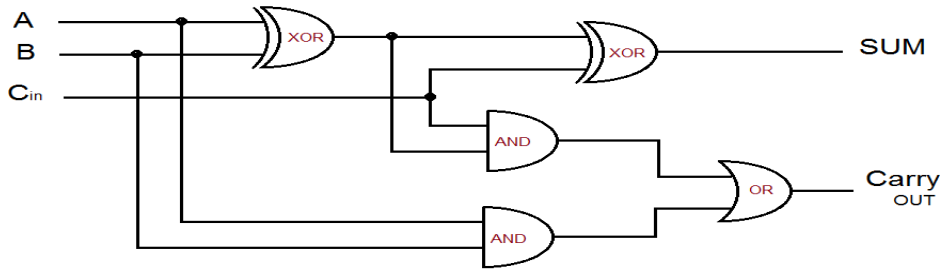
= AB + AC + B (1 + C) (A + 1 = 1)

= AC + AB + B

= AC + B(1 + A) (A + 1 = 1)

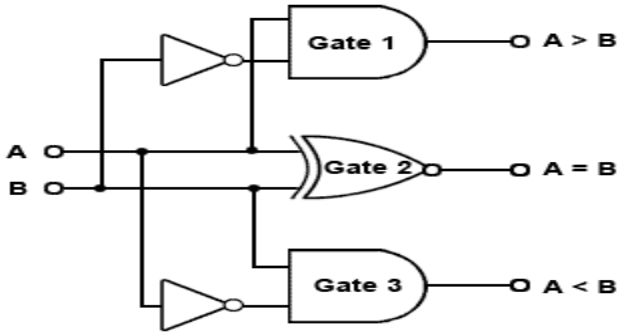
= B + AC

(b) Design a full adder circuit with truth table.



Inputs			Outputs	
A	B	C_{in}	Sum	Carry
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

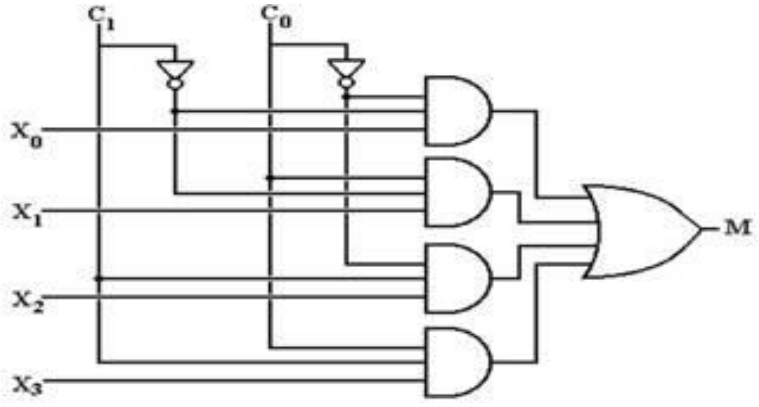
(c) Implement a comparator using logic gates.



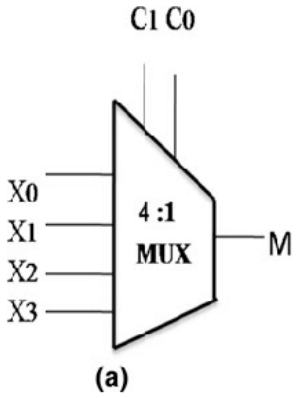
4. (a) Define and explain 4 : 1 multiplexer.

Multiplexer means many into one. A multiplexer is a circuit used to select and route any one of the several input signals to a single output.

A 4-to-1 multiplexer consists four data input lines as D0 to D3, two select lines as S0 and S1 and a single output line Y. The select lines S0 and S1 select one of the four input lines to connect the output line. The figure below shows the block diagram of a 4-to-1 multiplexer in which, the multiplexer decodes the input through select line.



The truth table of a 4-to-1 multiplexer is shown below in which four input combinations 00, 10, 01 and 11 on the select lines respectively switches the inputs D0, D2, D1 and D3 to the output. That means when S0=0 and S1 =0, the output at Y is D0, similarly Y is D1 if the select inputs S0=0 and S1= 1 and so on.



(a)

C1	C0	M
0	0	X0
0	1	X1
1	0	X2
1	1	X3

(b)

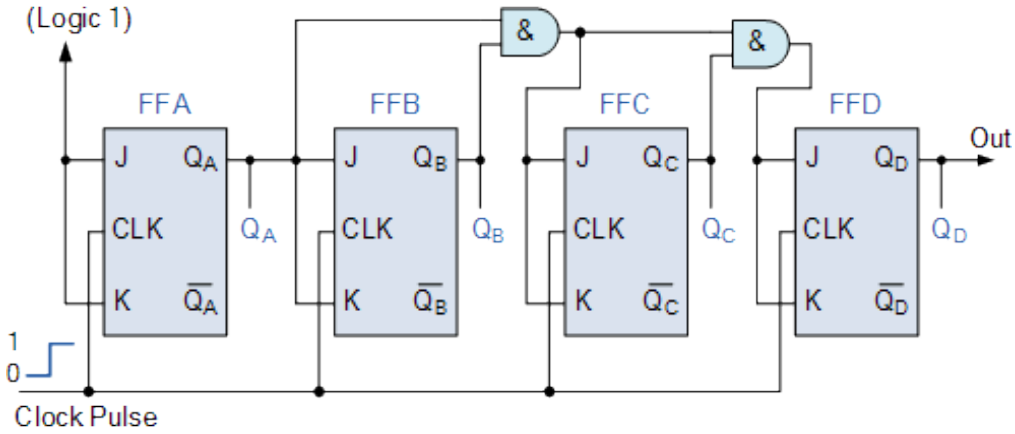
From the above truth table, we can write the output expressions as follows:

$$Y = S0\ S1\ D0 + S0\ S1\ D1 + S0\ S1\ D2 + S0\ S1\ D3$$

b. Explain the construction of 4 bit synchronous counter with Truth table.

External common clock pulses (pulses to be counted) are fed directly to each of the J-K flip-flop in the counter chain and both the inputs J and K are all tied together in toggle mode, but only in the first flip-flop, FFA are connected HIGH, logic "1" allowing the flip-flop to toggle on every clock pulse. Then the synchronous counter follows a predetermined sequence of states in response to the common clock signal, advancing one state for each pulse.

The J and K inputs of flip-flop FFB are connected directly to the output Q_A of flip-flop FFA, but the J and K inputs of flip-flops FFC and FFD are driven from separate AND gates which are also supplied with signals from the input and output of the previous stage. These additional AND gates generate the required logic for the JK inputs of the next stage.



State	Q_D	Q_C	Q_B	Q_A
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	1	0	1	0
11	1	0	1	1
12	1	1	0	0
13	1	1	0	1
14	1	1	1	0
15	1	1	1	1
0	0	0	0	0

Section- III

5.(a) List different types of flip flops

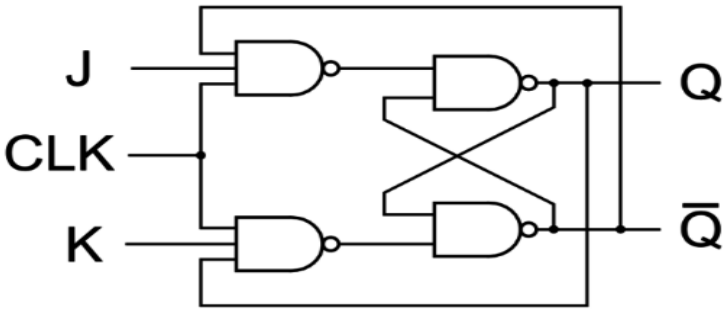
Different types of flip flops are –

- Set-Reset (SR) Flip-flop or Latch
- Clocked SR Flip flop
- JK Flip-flop
- Master Slave JK Flip-flop
- D (Delay) Flip-flop
- T (Toggle) Flip-flop.

(b) Describe J K Flip-flop work in with a diagram

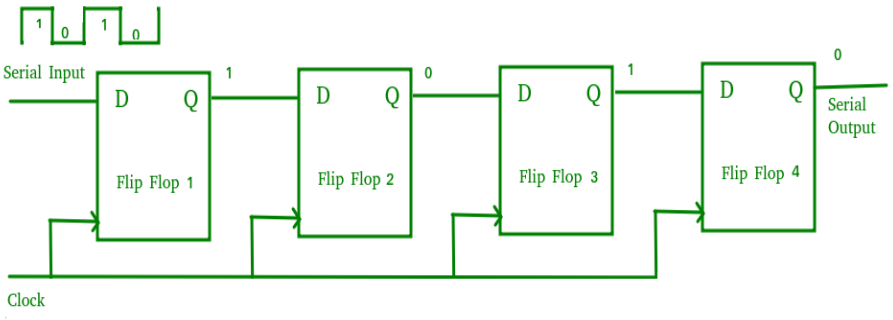
Working of JK flip flop

- If the inputs of both the set (J) and reset (K) are different, then the output 'Q' has the value of output 'J' that is the set. All this happens on the next edge of the clock input.
- If both the set (J) and reset (K) inputs are low, then no change will occur in the output 'Q'.
- If at the clock edge both the set (J) and reset (K) inputs are high, then the output 'Q' will move or toggle from one state to another.
- The best advantage of this circuit over all other flip flops is that it has no ambiguous states.



(c) Construct 4-bit SISO shift register & explain its working.

Serial In Serial Out (SISO) shift registers are a kind of shift registers where both data loading as well as data retrieval to/from the shift register occurs in serial-mode. Figure 1 shows a n-bit synchronous **SISO shift register** sensitive to positive edge of the clock pulse. Here the data word which is to be stored is fed bit-by-bit at the input of the first flip-flop. Further it is seen that the inputs of all other flip-flops (except the first flip-flop FF_1) are driven by the outputs of the preceding ones say for example, the input of FF_2 is driven by the output of FF_1. At last the data stored within the register is obtained at the output pin of the n^{th} flip-flop in serial-fashion.



(d) List applications of counter.

Counter applications is found in many digital electronic devices. Some of their applications are

- Frequency counters
- Digital clocks
- Analog to digital convertors.
- Frequency divider circuits.
- Timers in electronic devices like ovens and washing machines.
- Digital triangular wave generator by using counters.

6.(a) Classify computers based on purpose and size.

Classification according to purpose:

General-purpose computers and Specific purpose computers

Classification according to size:

Micro Computers, Mini Computers, Mainframes and Super Computers

(b) Distinguish between system software and application software.

System software – it consists of several programs which are directly responsible for controlling, integrating and managing individual hardware components. It acts as an interface between the hardware and software applications. It consists of

a. System Management Software

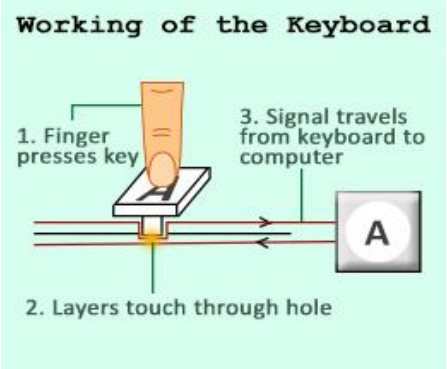
b. System development programs.

Application Software – application software is used by a general user to accomplish a specific task. Application software is used for a variety of purposes:

a. As a business tool
b. To assist with graphics and multimedia projects
c. To support home, personal and education activities
d. To facilitate communication
e. Entertainment industry

(c) Describe working of a keyboard.

A keyboard consists of a series of switches connected to a small keyboard microprocessor. This microprocessor monitors the state of each switch. When the user presses a key, it causes a change in the amount of current flowing in the circuit associated with that key. The keyboard microprocessor detects this change in the current flow. The processor can tell when a key is pressed or released. The circuit carries a signal to the microprocessor known as scan code of the key and this scan code is sent to the computer system. A copy of this code is also stored in the memory of the keyboard. When the computer system reads the scan code, it informs the same to the keyboard and scan code stored in the memory of the keyboard is erased. If one continues to hold down a key, then processor determines that the user wants to send that character repeatedly to the computer.



Section- IV

7. (a) Explain computer Network categories

A computer network is a collection of two or more computers, which are connected together to share information and resources. The 3 primary categories of network are:

Local area network – it covers a small geographical area such as an office, home or building. Computers are connected through a communication medium such as twisted pair cable or coaxial cable. LAN offers a bandwidth of 10-100Mbps and provides higher security.

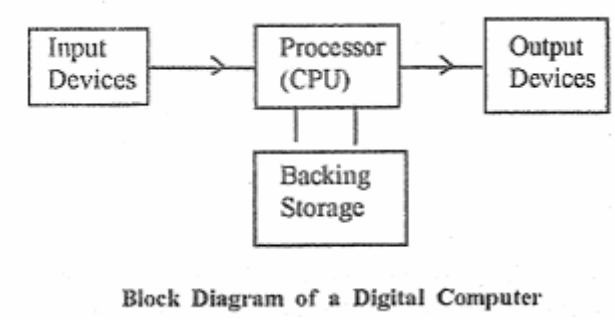
Metropolitan area network – it is spread over a larger geographical area such as a city. It connects different LAN's together to make one large network for the entire city. MAN may be operated by one organization or be shared by several organizations in the same city.

Wide area network – it extends over a large geographic area such as a state or a country. These networks use telephone lines, satellite links to connect. The internet is the largest WAN in the world. For example if a company has offices in Delhi, Mumbai and Bangalore, LAN's of each of these locations are connected to each other through WAN

(b) Describe online data processing method.

On-line Processing technique facilitates the entry and execution of data directly; so, it does not store first and then process. This technique reduces the data entry errors, as it validates data at various points and also ensures that only corrected data is entered. This technique is widely used for online applications.

(c) Explain functional units of computer with diagram.



Block Diagram of a Digital Computer

A computer system has the following components:

1. Central Processing Unit (CPU): Also known as processor, it is the brain of the computer system that processes data (input) and converts it into meaningful data (output). It is the administrative section of the computer that co-ordinates the operations and supervises instruction. It issues commands to all parts of the computer. It controls sequence of operations as per stored instructions. It stores data as well as instructions. It performs data processing and sends result to output unit. The CPU has three parts –

- **Arithmetic Logic Unit (ALU)** –performs arithmetic and logical operations on the available data.
- **Control unit** –checks the correctness of the sequence of instructions.
- **Registers** – these are special purpose, high speed temporary memory units to store data, instructions, addresses and intermediate results of calculations.

2. Input unit –accepts instructions and data from the user with the help of input devices such as keyboard, mouse etc. The input unit converts data into the form that the computer can understand.

3. Output unit –accepts outputs produced by the computer, converts them into user understandable form and supplies output to the user with the help of output devices such as printer, monitor etc

4. Storage unit –stores the input through input unit and results produced by the computer before supplying them to the output unit. two types of memory are – primary and secondary memory.

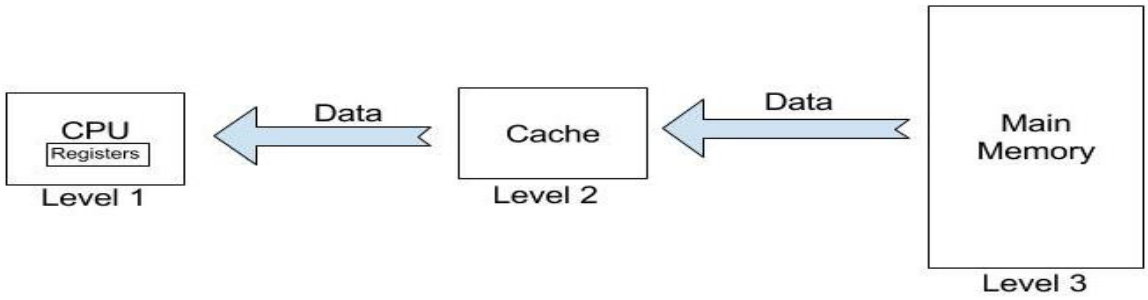
8. (a) Discuss Auxiliary memory.

Auxiliary memory also known as secondary memory this provides backup storage for instructions and data. The most commonly used secondary storage devices are magnetic disks and magnetic tapes. These are least expensive and have larger storage capacity than primary memory. Secondary storage devices are permanent in nature. Secondary memory is not directly accessible by the processor. The data and instructions have to be shifted to the main memory and then to the processor.

(b) Explain Cache memory.

Cache memory is a type of fast, relatively small memory that is stored on computer hardware. Cache are internal random-access memories (RAMs) that use semiconductor based transistor circuits. Cache holds a copy of only the most frequently used information or program codes stored in the main memory. The smaller capacity of the cache reduces the time required to locate data within it and provide it to the CPU for processing

The purpose of cache memory is to store program instructions that are frequently used by software during its general operations, so fast access is needed as it helps to keep the program running quickly. This memory is the fastest and most expensive also.



(c) Classify computers based on Flyns classification

Flyns classification divides computers into four major groups that are:

1. Single instruction stream, single data stream (SISD)
2. Single instruction stream, multiple data stream (SIMD)
3. Multiple instruction stream, single data stream (MISD)
4. Multiple instruction stream, multiple data stream (MIMD)

(d) Explain BIOS

BIOS (Basic Input Output System) is the first program or set of instructions that run when the computer is switched on (booting) is called BIOS. BIOS is a firmware, i.e. a piece of software permanently programmed into the hardware. BIOS perform POST (power on self test) for all of the computer's hardware components to make sure everything is functioning properly. The most important task that the BIOS perform is to load the operating system in computer.

Limitations of BIOS:

1. BIOS can boot from drives of less than 2 TB.
2. It can't initialize multiple hardware devices at once, thus leading to slow booting process.

Section- V

9. (a) Differentiate the following:

(i) Multitasking Operating System and Multiprocessing operating system.

S.No.	Multitasking	Multiprocessing
1	The execution of more than one process takes place simultaneously.	The presence of more than one processor in a system that can execute large no of instruction in parallel mode.
2	In this system the number of processor's is one.	In this system the number of processor's are more than one.
3	It takes more amount of time in process execution.	It takes less time in process execution.
4	In this, job is executed one by one at a time.	In this, more no of jobs can be executed at a time.
5	In this, the throughput is moderate.	In this, the throughput is maximum.
6	The efficiency of multitasking is moderate.	The efficiency of multiprocessing is maximum.
7	In this system the number of user is more than one.	In this system the number of user can be one or more than one.
8	In this system the whole process is depend only on one processor.	In this system the whole process is divided between the multiple processors.

(ii)Real time operating system and Batch processing operating system.

S.No.	Real Time Processing System	Batch Processing System
1	In real time processing processor needs to very responsive and active all the time.	In batch processing processor only needs to busy when work is assigned to it.
2	In this system, events mostly external to computer system are accepted and processed within certain deadlines.	Jobs with similar requirements are batched together and run through the computer as a group.
3	Time to complete the task is very critical in real-time	Completion time is not critical in batch processing.
4	Complex and costly processing requires unique hardware and software to handle complex operating system programs.	It provides most economical and simplest processing method for business applications.
5	Real-time processing needs high computer architecture and high hardware specification.	Normal computer specification can also work with batch processing.
6	It has to handle a process within the specified time limit otherwise the system fails.	In this processing there is no time limit.
7	Supports random data input at random time.	In this system data is collected for defined period of time and is processed in batches.
8	Examples of real-time processing are bank ATM transactions, customer services, radar system, weather forecasts, temperature measurement etc.	Examples of batch processing are transactions of credit cards, generation of bills, processing of input and output in the operating system etc.

(b) Write an algorithm for area of circle.

STEP 1: Start

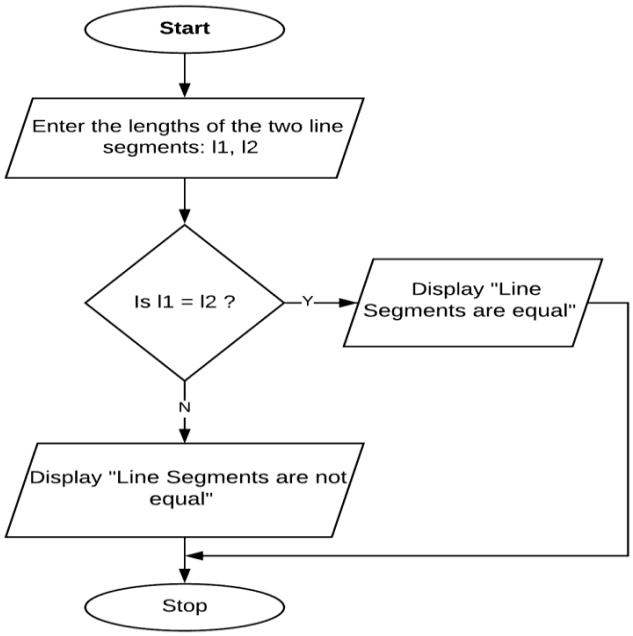
STEP 2: Input **r**

STEP 3: Compute **area= (22/7)*r*r**

STEP 4: Output **area**

STEP 5: Stop

(c) Draw flowchart to accept the length of two different line segments and check whether they are equal or unequal. Display the message accordingly.



10. (a) Explain generation of programming language. Give example for each.

First Generation – Machine Language

- Only binary numbers were used as the computers understand only binary codes - 0 and 1. Every instruction and data were written using 0's and 1's
- An instruction in machine language consists of 2 parts – the 1st part is the command which instructs the computer what functions are to be performed. 2nd part is the operand which instructs the computer where to find or store data.
- The machine language is difficult to write and remember

Second generation – Assembly language

- It was developed in the early 1950's and its main developer was IBM.
- This language assigns a mnemonic code to each machine language instruction to make it easier to remember or write. For example ADD for addition, MULT for multiplication.
- Assembly language is not a single language but a group of languages and each processor family has its own assembly language.
- The general format of assembly instruction is [LABEL] < OPERANDS> [; COMMENT]
  Eg : BEGIN ADD A, B ; ADD B TO A
- The assembly language program must be translated to machine code by a separate program called assembler.
- The original assembly language program is called source program and the final machine language program is called object code.

Third Generation: High level language

- During 1960's, computers started to become popular and it became necessary to develop languages that were more like natural languages such as English.
- Example Languages are COBOL, FORTRAN, BASIC and C.
- Programs written using high level languages were machine independent.
- Since computers understand only machine language, high level language needs to be converted into machine language. This is done by compilers and interpreters.

Fourth Generation:

- Third generation languages are considered as procedural languages whereas fourth generation languages are non-procedural
- In non-procedural method, the computer is instructed what it must do rather than how to do it.
- The programs were easier to write but they require more processing time.
- Example Languages are SQL, Perl, PHP, Python
- 4th generation languages are divided into 3 categories:
    1. Query languages – they allow the user to get information from databases by following simple syntax rules.
    2. Report generation – they produce customized reports based on data stored in the database. The user can specify the data and format of the data in the report.
    3. Application generators – the user writes programs to allow the data to be entered into the database. The program prompts the user to enter data and also checks validity of data.

Fifth Generation programming languages:

- These languages will be able to process natural languages.
- The computers will be able to accept, interpret and execute instructions in the native language of the end users.
- The programmers may simply type the instruction or tell the computer via a microphone what it needs to do.
- Example Languages are OPS5, Mercury
- These languages are closely linked to artificial intelligence.

(b) Define variable. Specify the rules for naming a variable. Give examples.

In programming, a variable is a container (storage area) to hold data. To indicate the storage area, each variable should be given a unique name. Variable names are just the symbolic representation of a memory location.

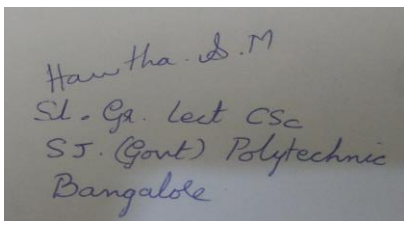
Rules for naming a variable

- A variable name can only have letter/s (both uppercase and lowercase letters), digits and underscore.
- The first letter of a variable should be either a letter or an underscore. Then followed by have letters, digits and underscore.
- Variable names are case sensitive.
- No spaces or special characters are allowed.
- Cannot use a keyword as a variable name
- There is no rule on how long a variable name (identifier) can be. However, you may run into problems in some compilers if the variable name is longer than 31 characters.

Examples

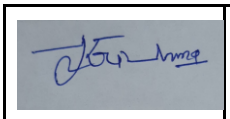
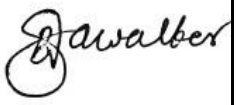
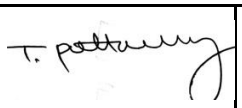
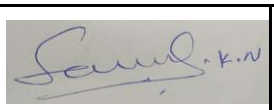
Valid variable names are- Num, a, x, _one, n1, n1value, etc.

Invalid variable names are – 123, 1value, result area, a$b, l/b, etc.



Board Members:

Sd/-

				
Krishna M D	BharatKumar V S	Puttaswamy T	Shekar K N	Usha D