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ST. LAWRENCE HIGH SCHOOL

A Jesuit Christian Minority Institution

Selection Test Examination- 2018

FOR GOD AND COUNTRY

Sub: Computer Science **Class: XII** **F.M.: 70**

Duration: 3 Hours & 15 Minutes **Date: 16th November, 2018**

SOLUTION

GROUP 'A'

(Multiple Choice Type Questions)

A. Choose the correct alternatives:

(i) A _____ is a linear data structure, that uses a Last In First Out (LIFO) access mechanism.

(a) Pointer (c) Queue

(b) Stack (d) None of these

Answer: (b)Stack

(ii) What will be the mod value of a counter made up of 'n' flip flops?

(a) $2n^2$ (b) 2n

(c) 2n-1 (d) n+1

Answer: (b)2n

(iii) Correct HTML code for the largest heading is:

(a) <head> (c) <heading>

(b) <h6> (d) <h1>

Answer: (d)<h1>

(iv) The forbidden state of the asynchronous NOR Latch is:

(a) S=1, R=0 (b) S=0, R=1

(c) S=1, R=1 (d) S=0, R=0

Answer: (c)S=1, R=1

(v) The transmission mode which allow both communication devices to transmit and receive data simultaneously is:

(a) Simplex (c) Half-duplex

(b) Full-duplex (d) None of these

Answer: (b)Full-duplex

(vi) Which media does not come under the guided media?

(a) Optical Fibres (c) Microwave

(b) Coaxial Cable (d) Twisted Pair

Answer: (c)Microwave

(vii) Which keyword is used to eliminate duplicate rows from the result of SELECT statement?

(a) WHERE (b) ORDER BY

(c) DISTINCT (d) None of these

Answer: (c)DISTINCT

(viii) An example of a bounded medium is:

(a) Coaxial Cable
(b) Wage guide
(c) Fibre optic Cable
(d) All of the above

Answer: **(d)All of the Above**

(ix) For the array arr, the expression *(arr+i) is same as:

(a) arr[i]
(b) arr[i+]
(c) *arr[i+1]
(d) &arr[i++]

Answer: **(a)arr[i]**

(x) The slowest transmission speeds are those of:

(a) Twisted Pair Wire
(b) Fibre optic Cable
(c) Coaxial Cable
(d) Microwaves

Answer: **(a)Twisted Pair Wire**

(xi) LAN stands for:

(a) Long area network
(b) Limited area network
(c) Local area network
(d) Local audible network

Answer: **(c)Local Area Network**

(xii) The Internet is owned by:

(a) The US Government
(b) A consortium of telecommunication companies
(c) The IETF
(d) None of the above

Answer: **(d)None of the above**

(xiii) Choose the odd one out:

(a) Web page
(b) Index page
(c) Home page
(d) Cover page

Answer: **(d)Cover page**

(xiv) Which one is not the language of Internet?

(a) PerL
(b) XML
(c) HTML
(d) CoboL

Answer: **(d)CoboL**

(xv) Which of the following is not a method of accessing the web:

(a) ISDN
(b) DSL
(c) MODEM
(d) CPU

Answer: **(d)CPU**

(xvi) Which of the following is related to Internet security?

(a) MIT
(b) DSL
(c) Firewall
(d) W3C

Answer: **(c)Firewall**

(xvii) Mechanism developed to enforce users to enter data in required format is:

(a) Data validation
(b) Criteria
(c) Input mask
(d) Data verification

Answer: **(c)Input Mask**

(xviii) Large collections of files are called:

(a) Fields
(b) Database
(c) Records
(d) File system

Answer: **(d)Database**

(xix) What is relational database?

(a) A place to store relational information
(b) A database that is related to other databases
(c) A database to store human relations
(d) None of these

Answer: **(a)A place to store relational information**

(xx) The Select and Project are:

(a) Unary operation
(b) Cartesian product operation
(c) Join operation
(d) All of the above

Answer: **(a)Unary Operation**

(xxi) A _____ database does not use pointers or physical links, but instead finds related records by examining the contents of fields

(a) Network
(b) Hierarchical
(c) Relational
(d) None of these

Answer: **(a)Relational**

GROUP 'B'

B. (i) What is a Gateway?

OR

What is Frequency Modulation?

Gateway: The term Gateway is used to describe a broad category of LAN interconnecting devices, which works up to the Application Layer of the OSI model. It basically acts as a translator between two networks running totally incompatible communication protocols.

OR,

Frequency Modulation: In this type of modulation, two different frequency levels are used to represent the two binary digits '1' and '0'.

(ii) What is a Latch?

Latch: These circuits respond during the high or low levels of clock signal.

(iii) Write down the full form of OSI.

OSI: Open System Interconnection

(iv) What is 'functional dependency'?

OR

Define Normalisation.

Functional Dependency: If in a relation R, a set of attributes $(X_1, X_2,\ldots,X_N)$ functionally determines another set of attributes $(Y_1, Y_2,\ldots,Y_M)$ from the same relation, then two tuples from R that have the same values for $(X_1, X_2,\ldots,X_N)$ must also have the same values for $(Y_1, Y_2,\ldots,Y_M)$.

OR,

Normalisation: Normalisation is the process of taking a relation through a series of tests to ensure data integrity and eliminate insertion, deletion and modification anomalies and other problems related to data reducdancy.

(v) Write down the truth table of T flip-flop.

Truth table of **T flip flop:**

Clk	T	Q_{n+1}	State
0/1	x	Q_n	Last
↑	1	Q_n	Toggle

(vi) What is Queue?

OR

What is a stack?

Queue: It is a linear data structure that uses a First In First Out (FIFO) access mechanism.

OR,

Stack: It is a linear data structure, that uses Last In First Out (LIFO) access mechanism.

(vii) What do you mean by the term 'Object' in OOP?

Object: In OOP objects are the things we think about first in designing a program and they are also the units of code that are eventually derived from the process.

(viii) What is a WAN?

WAN: Wide Area Network.

(ix) ASCII stands for _____ [Fill in the blank]

ASCII: American Standard Code for Information Interchange.

(x) What is 'Race Condition'?

Race Condition: A Race Condition occurs when two mutually exclusive events are simultaneously initiated different circuit elements by a single cause.

(xi) Mention one difference between primary index and secondary index.

OR

What do you mean by Indexed file organisation?

Primary index: It is based on the field on which the records are physically ordered in the data file.

Secondary Index: It can be based on any field of the data file.

(xii) What is the full form of FDDI?

FDDI: Fibre Distributed Digital Interface

(xiii) What is the purpose of iostream in C++?

The standard C++ library includes the header file **iostream,** where the standard input and output stream objects are declared.

(xiv) What is the function of calloc() ?

OR

What do you mean by pointer to a pointer?

Dynamic Memory Allocation: Dynamic memory allocation is the technique of obtaining memory space at execution time and release the space when no longer needed.

OR,

Pointer that stores the address of another pointer is called a **pointer to a pointer.**

GROUP 'C'

C. (i) (a) **Latch:** These circuits respond during the high or low levels of the clock signal.
Flip-Flop: These circuits respond during the rising or the falling edges of the clock signal.

(b) **Mater Slave J-K flip-flop:**

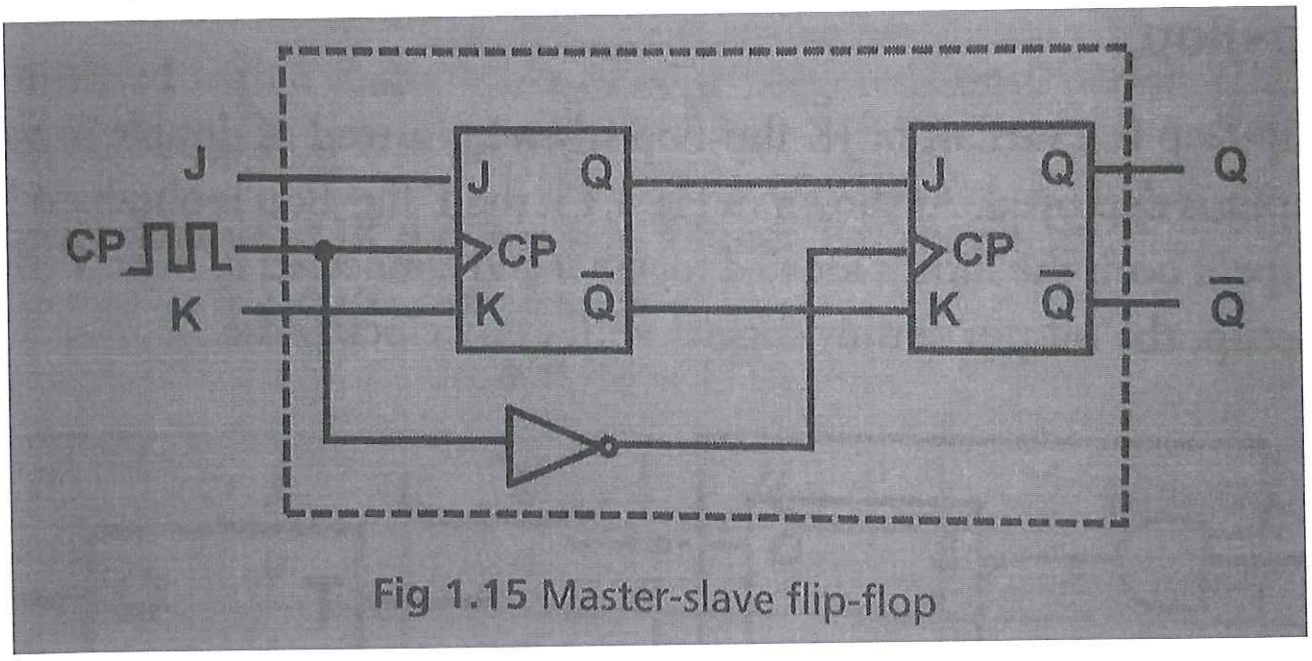


Fig 1.15 Master-slave flip-flop

(c) **Register:** For storing longer binary data, such as byte, we connect many flip flops, such an arrangement is known as Register.

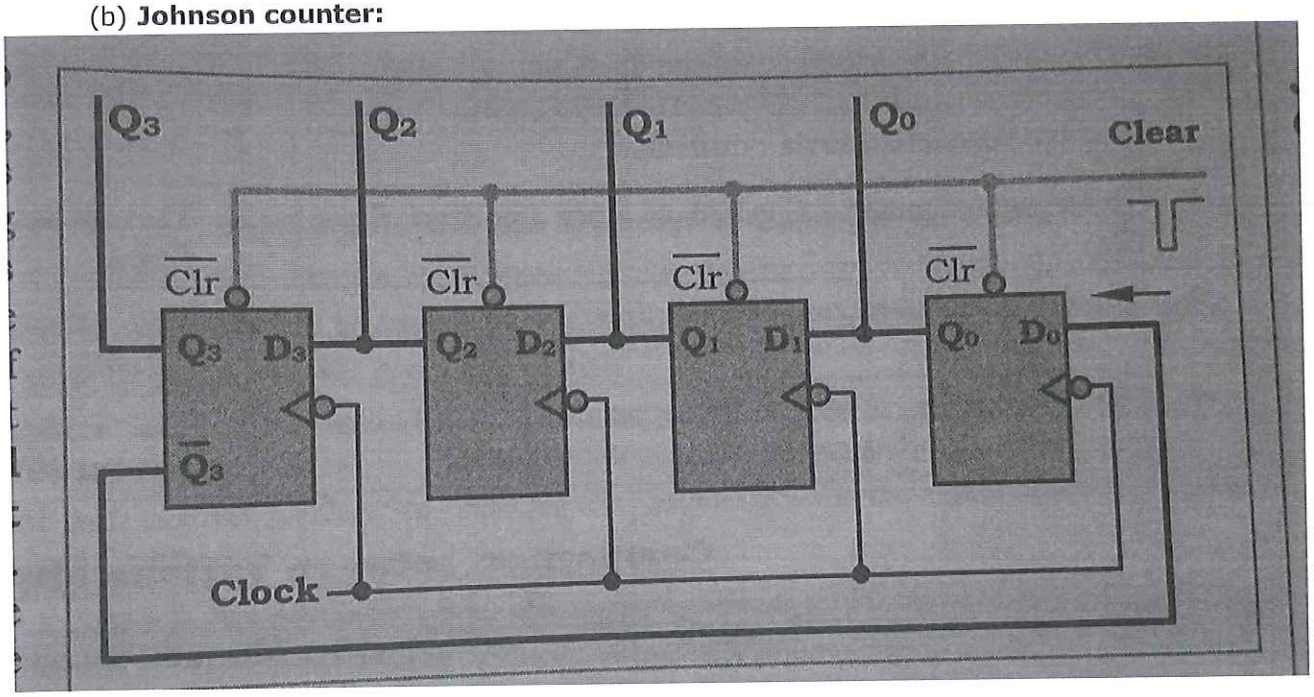
OR

(a)

Difference between Asynchronous and Synchronous Counters

Asynchronous Counter	Synchronous Counter
1. The same synchronising clock signal is not applied to all the flip-flops.	1. The same synchronising clock signal is applied to all the flip-flops.
2. Cascading effect of propagation delay is present that can cause undesired transient outputs.	2. All flip-flops synchronised with same clock. Hence cascading effect of propagation delay is minimum.
3. Such counters are slower in nature as compared to synchronous counters.	3. Such counters are faster in nature as compared to asynchronous counters.
4. Ripple counter is an example of an asynchronous counter.	4. Johnson counter is an example of a synchronous counter.

(b) **Johnson counter:**



(c) **Truth table of D Flip flop:**

State table for D flip-flop

Clk	D	Q_{n+1}	State
0/1	x	Q_n	Last
↑	0	0	Reset
↑	1	1	Set

(ii) (a) **Stack:** A stack is a LIFO type linear data structure.

Queue: A queue is a FIFO type linear data structure.

(b) **Infix:** A+B^C*(D+(E+F)/G)-H
Postfix: ABC^DEF+G/+*+H-

OR,

(a) **Dynamic Memory Allocation:** Creating and maintaining dynamic data structures requires dynamic memory allocation.

(b) **Linked List program:**

Algorithm-5: Procedure to Delete a Node at the Beginning of a Singly Linked List

Let **NODE** be a data type defined to store the data part **D** and link part **L** of any node in the linked **LIST**
NODE type pointer **START** points to the starting node of the **LIST**
NODE type pointer **TEMP** stores the address of the node to delete

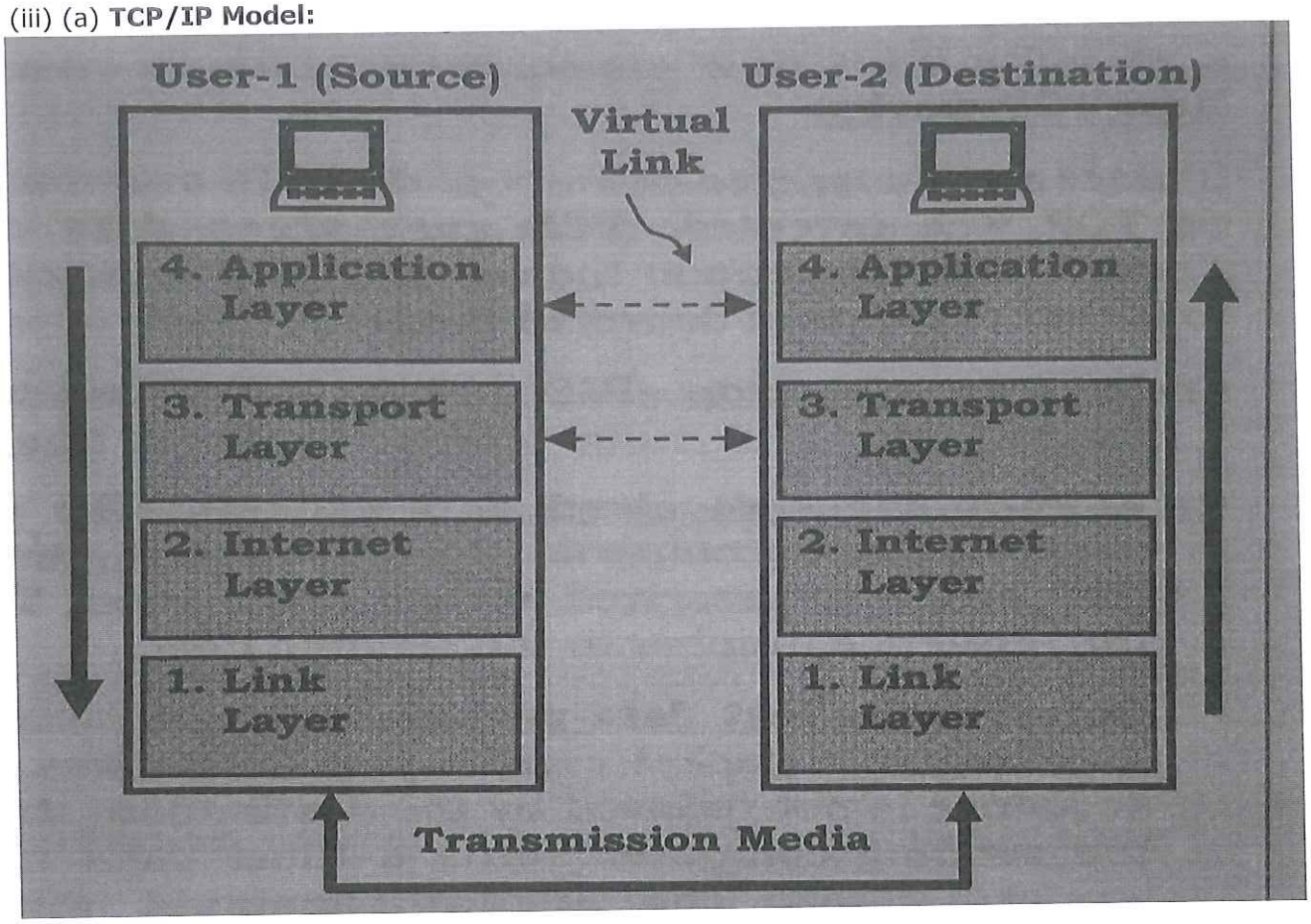
DEL_BEGIN ( ) *[Deletes a node from the beginning of a LIST]*
Step 1: Copy to TEMP the address in START *[Copies the address of the first node to TEMP]*
Step 2: Copy to START the address from START.L *[Moves START to the second node]*
Step 3: Free memory block pointed by TEMP
Step 4: End Procedure

Based on the above algorithm, we develop the program code in the form of a function called **del_begin()** that can delete a **NODE** type data from the **beginning of an existing linked list.**

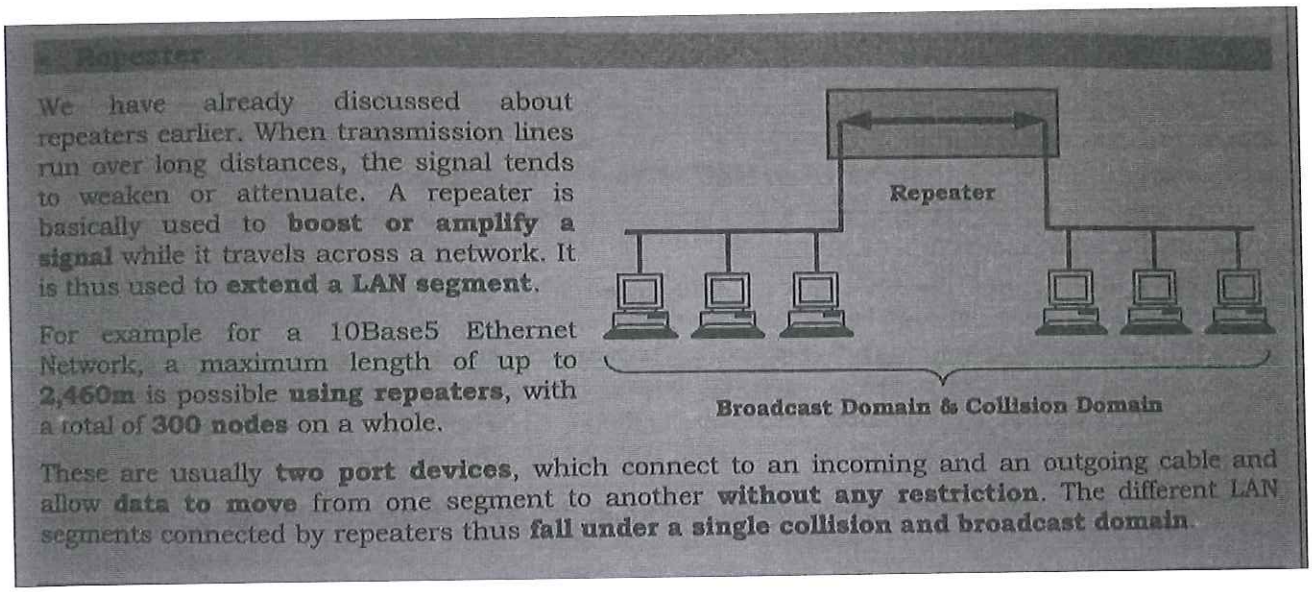
```
1  void del_begin()
2  { NODE *temp = start;          /*The starting address is copied to pointer temp   */
3    start = start->next;         /*start pointer is moved to the next node          */
4    free(temp);                  /*Original first node address in temp is freed     */
5  }
```

P2-14-13

(iii) (a) **TCP/IP Model:**



(b) **Repeater:**



We have already discussed about repeaters earlier. When transmission lines run over long distances, the signal tends to weaken or attenuate. A repeater is basically used to **boost or amplify a signal** while it travels across a network. It is thus used to **extend a LAN segment**.

For example for a 10Base5 Ethernet Network, a maximum length of up to **2,460m** is possible **using repeaters**, with a total of **300 nodes** on a whole.

These are usually **two port devices**, which connect to an incoming and an outgoing cable and allow **data to move** from one segment to another **without any restriction**. The different LAN segments connected by repeaters thus **fall under a single collision and broadcast domain**.

OR,

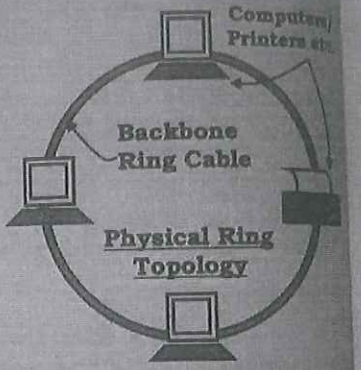
(a)**Ring Topology:**

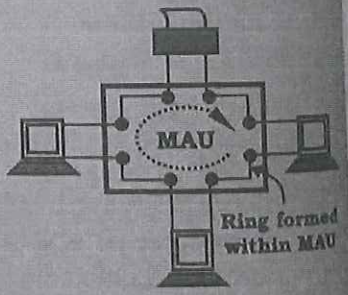
Layout:

In the Ring Topology, each device is **serially connected in a closed loop or ring pattern**, with each node connected to two other nodes.

Each node consists of an input and an output connection. The signal is received by the NIC at the input connection. **Inside the NIC the signal is regenerated** and passed on to the output connection. Ring topology uses **Shielded Twisted Pair cable** with **D connectors**.

In reality, the ring in a ring topology is actually formed within a central device called a **Multi-station Access Unit (MAU)**. Therefore from outside the topology looks like a physical star. The diagram below demonstrates the point.





Function:

To send data, a device has to collect a special electronic message called a token. The **message along with the token then travels in a circular manner** from one node to the next in a particular direction. The station whose **address matches** with the end address of the data **accepts** the data and acknowledges its receipt. It then retransmits the data **back to the source node**, where it is **finally removed** from the network and the token made free to be used by other nodes.

Example:

The **IBM Token Ring** network uses a ring topology. **FDDI networks** also use a ring topology.

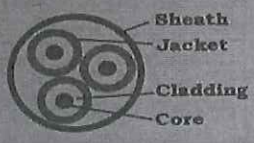
Advantage:

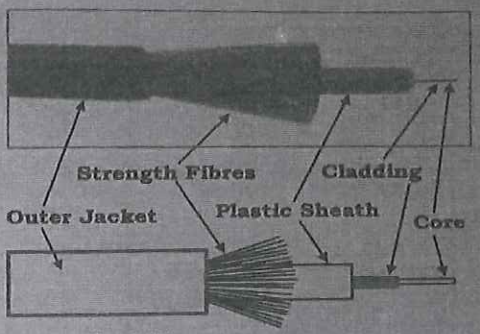
(b) **Fibre Optic Cable:**

d. Fibre-Optic Cable

Structure:

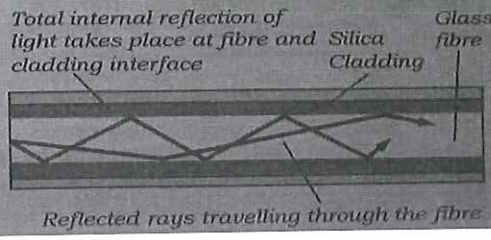
The cable consists of a central glass fibre **5-100 microns in diameter** and is surrounded by a layer of **pure silica** called **cladding**. To protect it, a plastic jacket can be present outside the cladding. The plastic jacket in turn can be **reinforced with** strength fibres like **Kevlar fibres** to protect the fibre. The cable finally has an outer insulating jacket made of Teflon or PVC. These fibres are typically **grouped in bundles**, protected by an outer sheath (see figure on the left).





Operation:

The principle of **total internal reflection of light** is used to propagate light signals through the glass fibres. Either an **LED** (short distance) or a **laser source** (long distance) is used to generate the signal. A **photodiode** is used to receive the signal. It generates electric pulses when light pulses fall on it. The **angle** at which the light enters the optical fibre cable is called the **mode of transmission**.



(iv) **(a) Inheritance:** It is the process of forming a new class from an existing class. One important application of this process is code reusability.

(b) Looping in C++: While Loop, For Loop, Do While, Nested Loops

OR,

(a) Private & Public class in C++:

Any class member will have one of the following levels of accessibility: **public**, **private** or **protected**. The ones with public access can be used anywhere without any access restrictions. The ones with private access can be used only by members and friends of a class. Finally the protected ones can be used only by members and friends of a class and the members and friends of classes derived from the class.

Note that the members who are declared using the keyword *class* are *private* by default. However members of classes declared with the keyword *struct* or *union* are *public* by default. Thus we can say that members' access determines if a class member is accessible in an expression or declaration.

(b) Constructor and Destructor:

Classes have a complex internal structure. This is so because they include both data and functions. As a result, object initialisation and cleanup for classes is a complex task compared to simple data structures. Therefore to construct and destroy class objects, C++ uses special member functions of classes called **constructors** and **destructors**. Constructor involves memory allocation and initialisation for objects, while destructor involves cleanup and de-allocation of memory for objects.

Just as other member functions, both constructors and destructors are declared within a class declaration. They can either be defined inline or external to the class declaration. You can include default arguments along with the constructors.

Constructors can have default arguments. While other member functions cannot have member initialisation lists, constructors can have. Both constructors and destructors are bounded by the following set of restrictions:

- In both constructors and destructors there are no return types. Also both cannot return any values.
- Both references and pointers cannot be used either in constructor or destructor.
- Both constructors and destructors cannot be declared static, const or volatile.
- Unions cannot hold class objects that have constructors and destructors.

(c) ADT: Abstract Data Type.

(v) SQL Commands:

Solution:

a)
```
SELECT  EmpName
FROM    WORKS
WHERE   CompanyName = 'XYZ' ;
```

b)
```
UPDATE  COMPANY
SET     City = 'Kolkata'
WHERE   CompanyName = 'ABC' ;
```

c)
```
ALTER TABLE   EMPLOYEE
DROP          Street ;
```

d)
```
SELECT  EMPLOYEE.EmpName, EMPLOYEE.Age
FROM    EMPLOYEE, WORKS
WHERE   EMPLOYEE.EmpName = WORKS.EmpName
AND     WORKS.Salary > 15000 ;
```

e)
```
SELECT  EMPLOYEE.EmpName, EMPLOYEE.Age
FROM    EMPLOYEE, WORKS
WHERE   EMPLOYEE.EmpName = WORKS.EmpName
AND     WORKS.Salary < 10000
AND     WORKS.CompanyName = 'ABC' ;
```

f)
```
SELECT  EMPLOYEE.EmpName
FROM    EMPLOYEE, WORKS, COMPANY
WHERE   EMPLOYEE.EmpName = WORKS.EmpName
AND     COMPANY.CompanyName = WORKS.CompanyName
AND     EMPLOYEE.City = COMPANY.City ;
```

g)
```
SELECT  WORKS.EmpName
FROM    WORKS, COMPANY
WHERE   COMPANY.CompanyName = WORKS.CompanyName
AND     COMPANY.City <> 'Kolkata' ;
```