



# ST. LAWRENCE HIGH SCHOOL



SELECTION TEST - 2019  
CLASS - 12

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*26/11/19*

SUBJECT - COMPUTER SCIENCE SOLUTION  
DURATION - 3 HOURS 15 MINUTES

F.M. :70  
DATE -20.11.2019

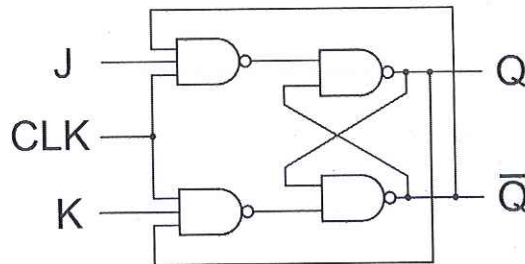
PART - A  
(MARKS: 35)

A) Answer the following questions in short

7X5 = 35

i) (a) Draw the circuit diagram of a JK flip-flop.

A:



(b) Draw its state table.

A:

Inputs		Outputs	
J	K	$Q_n$	$Q_{n+1}$
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

(c) How can you convert a JK flip-flop to a T flip-flop?

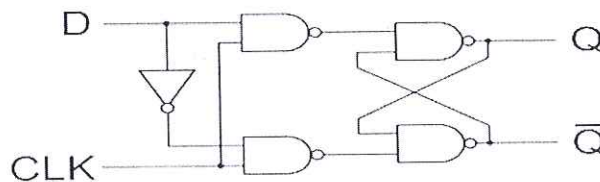
4+2+1

A: T-type flip-flop can be constructed from a JK flip-flop (or D-type flip-flop) by connecting the J input with the K input and both to logic level "1".

OR

(a) Draw the circuit diagram of D flip-flop.

A:



ii) (a) Write the algorithm for 'PUSH' operation of a stack.

A:

Array **STACK[ MAX ]** which can store **MAX** number of values, is used to create the stack. *[0 based address used]*  
 Variable **TOP** is initialised to **-1**. *[TOP will store the index of the last value entered into the array]*  
**PUSH ( VAL )** *[The procedure pushes a value VAL into a stack]*  
**Step 1:** If ( **TOP** is equal to **MAX-1** ) *[Indicates the array is full]*  
     a. Print "Stack Overflow" and Return  
**Step 2:** Increase **TOP** by 1 *[TOP now points to the position where the value is to be pushed]*  
**Step 3:** Copy to **STACK[TOP]** the value **VAL**. *[The value pushed to the top of the stack]*  
**Step 4:** End Procedure

(b) Explain **Calloc()** with example

A:

**calloc()**: This is very similar to **malloc()**. However it takes two arguments. The first argument indicates the total number of variables to be declared and the second argument indicates the size of each variable type. However unlike **malloc()**, after reserving the memory block, **calloc()** simultaneously initialises the memory locations to zero. If the allocation fails, it also returns a **NULL** pointer. Example: **calloc(n, sizeof(int))**

(c) What is Queue Overflow?

A: An incident that takes place from trying to add an element onto a full queue.

4+2+1

OR

(a) Write an algorithm to insert a new node in the head of linked list.

A:

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 a new node  
**ADD\_BEGIN ( DATA )** *[Adds a node with DATA at the beginning of a LIST]*  
**Step 1:** Allocate memory to create a new **NODE** type data and store its address in **TEMP**  
**Step 2:** Copy to **TEMP.D** the **DATA** received by the procedure *[Copies data passed to function to the data part D]*  
**Step 3:** Copy to **TEMP.L** the address in **START** *[Connects the new node to the node pointed by START]*  
**Step 4:** Copy to **START** the address in **TEMP** *[Makes START point to the new node pointed by TEMP]*  
**Step 5:** End Procedure

(b) What do you mean by command line argument? Write the syntax.

A: Command line argument is a parameter applied to the program when it is invoked. It is an important concept in C programming. It is mostly used when we need to control a program from outside. Command line arguments are passed to the main method.

Syntax:

```
int main (int argc, char *argv[ ])
```

here, 'argc' counts the number of arguments on the command line and, 'argv' is a pointer array which holds pointers of type char which points to the argument passed to the program.

4+(2+1)

**iii) (a) Write down the different modes of communication.**

**A:** Write about Simplex, Half Duplex and Full Duplex

**(b) Write short notes on:**

**i. Router** - A router is a networking device that forwards data packets between computer networks. Routers perform the traffic directing functions on the Internet. Data sent through the internet, such as a web page or email, is in the form of data packets.

**ii. TELNET** - Telnet is a network protocol that provides a command-line interface to communicate with a device. Telnet is used most often for remote management but also sometimes for the initial setup for some devices, especially network hardware such as switches and access points.

**3+(2+2)**

**OR**

**(a) Define Protocol.**

**A:** A protocol is a set of rules and guidelines for communicating data. Rules are defined for each step and process during communication between two or more computers. Networks have to follow these rules to successfully transmit data.

**(b) State three advantages of UTP cable in a computer network.**

**A:** Advantages are:

- UTP cables are the most commonly used networking cables on the market and are considered to be the fastest copper-based medium available.
- They are less expensive than STP cables, costing less per meter than other types of LAN cabling. This makes them not only more affordable but more easily dispensable.
- It is the most compatible cabling and can be used with most other major networking systems and does not require grounding.

**(c) Write a short note on 'www'.**

**A:** The World Wide Web (WWW) is a network of online content that is formatted in HTML and accessed via HTTP. The term refers to all the interlinked HTML pages that can be accessed over the Internet. The World Wide Web is most often referred to simply as "the Web."

The WWW has a unique combination of flexibility, portability and user-friendly features that distinguish it from other services provided by the Internet. The main reason for its popularity is the use of a concept called hypertext. Hypertext is a new way of information storage and retrieval, which enables authors to structure information in novel ways. An effectively designed hypertext document can help users rapidly locate the desired type of information from the vast amount of information on the Internet.

The WWW uses the client-server model, and an Internet protocol called hypertext transport protocol (HTTP) for interaction between the computers on the Internet. Any computer on the Internet, which uses the HTTP protocol is called a Web server and any computer, which can access that server is called a Web client.

**2+3+2**

**iv) (a) What is Insertion and Deletion Anomaly? Provide example.**

**A:** An insertion anomaly is the inability to add data to the database due to absence of other data.

A deletion anomaly is the unintended loss of data due to deletion of other data

**(c) When a relation is said to be in 3NF?**

**A:** A relation that is in First and Second Normal Form and in which no non-primary-key attribute is transitively dependent on the primary key, then it is in Third Normal Form (3NF).

Note – If A->B and B->C are two FDs then A->C is called transitive dependency.

$$\left(2\frac{1}{2} + 2\frac{1}{2}\right) + 2$$

OR

(a) Explain with suitable example, what is 'Cardinality' and 'Degree' of a relation in DBMS?

(b) Do the following tasks using SQL commands from the table provided:

*PLAYER(Name, DOB, Games\_Played, Years\_of\_Experience)*

i) Find the names of players and the games played by them, who are born after 10/10/2000.

A: SELECT Name, Games\_Played  
FROM PLAYER  
WHERE DOB > 10/10/2000 ;

ii) What is the maximum year of experience by a player?

A: SELECT MAX (Years\_of\_Experience)  
FROM PLAYER ;

(2+2)+(2+1)

v) (a) Give the difference between Public and Private member of a class in C++.

A: Public:

All the class members declared under public will be available to everyone. The data member and member functions declared public can be accessed by other classes too. The public members of a class can be accessed from anywhere in the program using the direct member access operator (.) with the object of that class.

Private:

The class members declared as private can be accessed only by the function inside the class. They are not allowed to be accessed directly by any object or function outside the class. Only the member function or the friend functions are allowed to access the private data members of a class.

(c) Describe the characteristics of a destructor in C++.

- A:
1. They are invoked automatically when the objects are destroyed
  2. They obey the usual access rules that other member functions do.
  3. They cannot be inherited.
  4. No argument can be provided to a destructor, neither does they return any value.
  5. Destructors cannot be virtual.
  6. They cannot be static.
  7. Their address cannot be referred.
  8. If there is no destructor in a class, a default destructor is generated by compiler.

(d) What do you mean by 'get from' operator in C++? Give syntax.

A: In C++, input and output operators are used to take input and display output. The operator used for taking the input is known as the extraction or 'get from' operator (>>) **3+2+(1+1)**

OR

(a) What do you mean by Data member?

**A:** Data members are the data variables declared inside a class that maybe of any of the fundamental types, as well as other types including pointer, reference, array, bit fields and user defined types. We can declare a data member the same way as a variable, except that explicit initializers are not allowed inside the class definition.

- (b) Write a program in C++ that accepts two numbers as input and finds the sum using class and object. 2+5

**PART- B**  
**(MARKS: 35)**

- B) Select the correct answer from the alternatives : 1X21=21

- i) Instead of interaction between functions, programs are designed to work with \_\_\_\_\_ in an OOP language:  
(a) methods                      (b) data                      (c) values                      (d) objects
- ii) Which operation in Relational algebra is used to get a subset of rows from a relation R? :  
(a) Rename      (b) Cross Product      (c) Projection      (d) Selection
- iii) What is the cardinality of the resultant relation when a Cartesian product is formed between the relations P(A1, A2, A3) and P having 8 tuples and Q having 6 tuples?  
(a) 6                      (b) 5                      (c) 14                      (d) 48
- iv) The rule that the primary key value in a tuple cannot contain a Null value is called :  
(a) Entity Integrity Constraint                      (b) Null Constraint  
(c) Referential Integrity Constraint                      (d) Domain Constraint
- v) In case the change of some data in a database leads to inconsistent data, then such a problem is called:  
(a) modification anomaly                      (b) deletion anomaly  
(c) insertion anomaly                      (d) None of these
- vi) The design and structure of a database is usually specified by the:  
(a) DDL                      (b) DML                      (c) DDL                      (d) DQL
- vii) In an ER diagram of a database, a rhombus represents:  
(a) An entity                      (b) a relationship

- (c) a key (d) None of these
- viii) Which of the clauses is used with the 'group by' clause in SQL?  
(a) in (b) like (c) where (d) having
- ix) Which of the following is not a guided media?  
(a) Optical fibre (b) UTP cable (c) Coaxial cable (d) Microwave
- x) E-mail is downloaded from the mailbox using the protocol:  
(a) FTP (b) IMAP (c) SMTP (d) POP3
- xi) Which of the following communication modes supports two way traffic, but in only one direction at a time?  
(a) Half Duplex (b) Full Duplex (c) Asynchronous (d) Simplex
- xii) For the declaration `int z = 15, *pz = &z, *py;` which of the following options is valid?  
(a) py = pz; (b) `*py = *pz;` (c) `py = z;` (d) `*py = z;`
- xiii) The address of a variable can be obtained in C using which of the following operators?  
(a) & (b) \* (c) -> (d) %
- xiv) When data is transferred from a file to a program, then it is called :  
(a) file transfer (b) file process (c) file input (d) file output
- xv) The postfix notation for the infix expression  $A/(B - C)$  will be :  
(a)  $AB - / C$  (b)  $ABC - /$  (c)  $A - / BC$  (d) None of these
- xvi) In an empty stack created using a linked list the stack top pointer will point to:  
(a) 0 (b) NULL (c) +1 (d) - 1
- xvii) A sequential logic circuit can be designed by using the concept of signal \_\_\_\_\_  
(a) feedback (b) level (c) clock (d) transition
- xviii) Time taken by a signal to travel from input to output of an electronic circuit is called the:  
(a) Output time (b) propagation delay (c) time gap (d) start time
- xix) An array of flip – flops used to store multiple bits is called a :  
(a) decoder (b) encoder (c) register (d) counter

xx) What will be the mod value of a counter that has the following counting states:

- (a) 8            (b) 15            (c) 3            (d) 4

xxi) A 3 bit counter can produce a maximum of how many output states?

- (a) 8            (b) 3            (c) 6            (d) 16

C) Answer the following questions in short(Alternatives are to be noted):

1X14 = 14

i) **Define Constructor in C++ .**

**A:** A constructor is a member function of a class which initializes objects of a class. In C++, Constructor is automatically called when object(instance of class) create. It is special member function of the class.

**OR**

**Define class in C++.**

**A:** A class in C++ is the building block, which leads to Object-Oriented programming. It is a user-defined data type, which holds its own data members and member functions, which can be accessed and used by creating an instance of that class. A C++ class is like a blueprint for an object.

ii) **Which HTML tag is used to create a table?**

**A:** TABLE tag

iii) **Write the full form of TCP/IP.**

**A:** Transmission Control Protocol and the Internet Protocol

**OR**

**Write the full form of CSMA/CD.**

**A:** Carrier-sense multiple access with collision detection

iv) **What do you mean by Broadband Network?**

**OR**

**Write the advantage of Star topology over Mesh topology.**

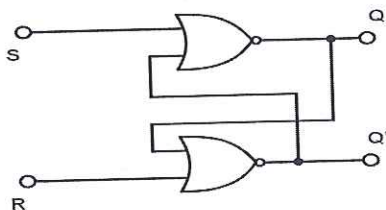
**A:** The Star topology organises the nodes in a star shape where the central hub is connected to all the other nodes. ... Flexibility and scalability of the star topology is good whereas mesh topology is less scalable as it directly increases the cost of the system. Mesh topology is complicated as compared to the star topology

v) **Write down one advantage of linked list over array.**

**A:** The principal benefit of a linked list over a conventional array is that the list elements can be easily inserted or removed without reallocation or reorganization of the entire structure because the data items need not be stored contiguously in memory.

vi) **Draw a circuit diagram of a basic flip-flop using NOR gate.**

**A:**



OR

**Why D flip - flop is called Delay flip-flop?**

**A:** It is called the Delay flip-flop, since the output takes the value of the D input or Data input, and Delays it by one clock count.

**vii) What do you mean by positive edge triggering?**

**A:** Describing a circuit or component that changes its state only when an input signal becomes high.

**viii) What is the use of the indirection operator in C?**

**A:** The indirection operator is a unary operator represented by the symbol (\*). It is an operator used to obtain the value of a variable to which a pointer points. While a pointer pointing to a variable provides an indirect access to the value of the variable stored in its memory address, the indirection operator dereferences the pointer and returns the value of the variable at that memory location.

**ix) What is the main function of DBA?**

OR

**What is Candidate key?**

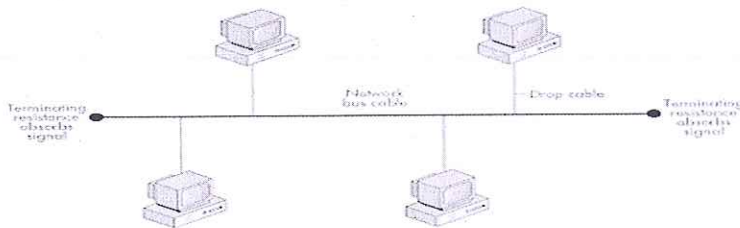
**A:** The minimal set of attribute which can uniquely identify a tuple is known as candidate key

**x) Write the syntax to insert a picture named 'Picture1.jpg' in a webpage.**

**A:** `<img src = "Picture1.jpg">`

**xi) Draw a simple diagram of Physical Bus Topology.**

**A:**



OR

**What is the function of Gateway?**

**A:** A gateway is a data communication device that provides a remote network with connectivity to a host network.

A gateway device provides communication to a remote network or an autonomous system that is out of bounds for the host network nodes. Gateways serve as the entry and exit point of a network; all data routed inward or outward must first pass through and communicate with the gateway in order to use routing paths. Generally, a router is configured to work as a gateway device in computer networks.

**xii) Give one example of Non – linear Data Structure.**

**A:** Tree , Graph.

OR

**What is Queue Overflow?**

**A:** An incident that takes place from trying to add an element onto a full queue.



**xiii) What is array of pointer in C language?**

**A:** As we know that, pointers are the special type of variables that are used to store the address of another variable. And array is the group of similar type of variables (using single name for all variables), that takes contiguous memory locations. "Array of pointers" is an array of the pointer variables.

**OR**

**What is the use of free() in C language?**

**A:** The function free() is used to de-allocate the memory allocated by the functions malloc ( ), calloc ( ), etc, and return it to heap so that it can be used for other purposes. The argument of the function free ( ) is the pointer to the memory which is to be freed.

**xiv) Write one advantage of using D flip flop?**

**A:** The advantage of D flip-flops is their simplicity and the fact that the output and input are essentially identical, except displaced in time by one clock period.

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