Code: CBSE22

Roll No: 16MCA047

MCA (Sem-II) Examinations – 2016-17
Object-Oriented Programming in C++ (Theory)

Time: 2 Hours

Max Marks: 75

- Write your Roll no. on the top immediately on receipt of the question paper.

- Attempt ALL questions by selecting any TWO parts. All Question carry equal marks.

1. (a) Distinguish between Procedure-Oriented and Object-Oriented paradigms with suitable examples. What are the Pros and Cons of Object-Oriented Methodology? Explain.

    (b) Describe the different derived data types available in C++. Explain the explicit & implicit type conversions with suitable examples.

    (c) What are input and output streams? Explain various streams available in C++ with suitable examples.

2. (a) What is a friend function? What are the merits and demerits of a friend function? How does friend function act as a bridge between two classes? Explain with a suitable example.

    (b) Explain the differences between passing arguments "by reference" and "by addresses" to functions. Explain the use of *this* pointer through an example.

    (c) Define a class *Student* which has *rollno* and *name* as data members. Define the constructor, the destructor and a function print() which prints the details of a student. Create an object of type *Student* in main() and print it.

3. (a) What is operator overloading? Write the rules used for overloading operators. List out the operators that cannot be overloaded using a member function. Write a program to concatenate (join) two objects of class *String* by overloading '+' operator.

    (b) What do you mean by overloading of a function? On what basis, the compiler distinguishes between a set of overloaded functions having the same name. Write a program to compute the area of a triangle and circle by overloading the area function.

    (c) Explain how the static data members and static member functions are declared and used in C++.

4. (a) Explain the usage of public, private and protected access modifiers for members in inheritance through suitable examples. What is Inheritance? Explain different types of Inheritance with suitable examples. What problem may be encountered in Multiple Inheritance and how is it solved? Explain.

    (b) What is virtual function? What is the difference between static binding and run-time binding? Explain with a suitable C++ code.

    (c) What do you mean by Abstract class and pure virtual functions? What is the use of an Abstract class? Explain the difference between function overloading and function over-riding with the help of suitable examples.

5. (a) Explain any three classes used for the file stream operations with examples. Write a program in C++ to open a file *"Hello.dat"* and write a text to the file. Read the file and display its content.

    (b) What do you mean by Exceptions? What mechanism is used for handling exceptions in C++? Write a program to explain the usage of *try* and *catch* blocks.

    (c) What do you mean by generic function and generic class? What are its benefits? Write a generic class and generic member function to find the sum of two complex numbers with real and image data members of any numeric types.

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MCA (SEM-II) EXAMINATIONS – 2016-17

Theory of Computation

Time: 2 Hours

Max Marks: 75

- Write your Roll No. on the top immediately on receipt of the question paper.

- Attempt ALL questions by selecting any TWO parts. All questions carry equal marks.

1. (a) Compare the proof techniques referred to as Mathematical, Strong Mathematical and Structural Induction, on relevant attributes and utility. Prove using the most efficient method that 'a square can be divided into two equal squares'.

   (b) Configure appropriately and design a DFA over the alphabet $\Sigma = \{0, 1\}$ that accepts all the strings with at most three 1s. Demonstrate systematically the acceptance and rejection using an example for each.

   (c) Describe the accepted language L(M) and the machine M, depicted by the DFA using bubble diagram below.
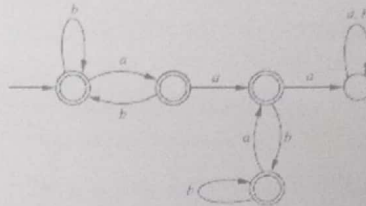
2. (a) What are Regular Languages and methods for testing the regularity of a language? Show that the language $L = \{a^n : n \geq 3\}$ is regular.

   (b) State and prove the Pumping Lemma, and highlight its exclusive utility. Evaluate, showing all the stages, the non-regularity of the language $L = \{0^i 1^j : i > j\}$ using pumping Lemma.

   (c) Find a grammar that generates the language L, giving a complete justification for your answer, defined as $L = \{ww^R : w \in \{a, b\}^+\}$.

3. (a) Elaborate the concepts of linear, left linear and right linear grammar, with a suitable example each. Can every linear grammar be converted to a form in which all production look like $A \rightarrow ax$, where $a \in T$ and $x \in V \cup \{^\wedge\}$? Justify.

   (b) Convert the Context Free Grammar (CFG) given below to Chomsky Normal Form (CNF), showing all the stages clearly: $S \rightarrow ASA | aB$, $A \rightarrow B | S$, $B \rightarrow b | ^\wedge$

   (c) Illustrate the concept of ambiguity and its removal procedure. Is it possible for a regular grammar to be ambiguous? Justify.

4. (a) Compare Push Down Automata (PDA) and Non-deterministic Push Down Automata (NPDA), with an example each? Can we convert a NPDA into PDA? Justify.

   (b) Determine whether language, $L = \{a^n b^n c^n : n \geq 0\}$ is a context free, showing all the stages of applying pumping lemma.

   (c) Elaborate the procedure for transforming a CFG into PDA, and convert the following CFG into a PDA: $S \rightarrow ^\wedge | a | b | aSa | bSb$

5. (a) What are standard Turing machine, transducers and Turing machines as transducers? Illustrate each with an appropriate example.

   (b) Design a Turing Machine for the following language described by $L = \{a^n b^n c^n | n >= 1\}$. Show all the development stages precisely and in order.

   (c) For any context-free grammar that does not generate $^\wedge$, is it possible to find an equivalent grammar in Greibach normal form? Transform the grammar given below in Greibach normal form, if possible: $S \rightarrow aSb | ab | bb$

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Code: CSCC 25

Roll No..................

MCA (SEM-II) EXAMINATIONS – 2016-17
Systems Analysis and Design

Time: 2 Hours

Max Marks:75

- Write your Roll No. on the top immediately on receipt of the question paper.

- Attempt all questions selecting two parts from each. All questions carry equal marks.

1. (a) Information Systems have become essential in today's business environment, and have been pushed at the centre stage of modern management. Do you agree with the statement? Justify with reasons. Cite two prominent examples from real life applications to support your answer.

   (b) Identify potential stakeholders in an information system project of your choice. Mention their individual concerns, respective roles, along with the set of inputs, processes, and corresponding outputs, associated with each activity.

   (c) Precisely discuss the multifaceted role played by a system analyst for developing the software. Enumerate desirable/preferable skills and key traits of a person to be appointed as system analyst.

2. (a) Why do so many software projects fail? Briefly discuss some of the principal reasons for system failure.

   (b) In a student hostel, Billing and 'Store issue and Control' are the sub-domains of the mess management system. Identify the strategic, tactical and operational level decisions (two each), which are usually taken by the management. Write down the key information needed for each of these decisions.

   (c) Compare and contrast interview with questionnaire technique. Write the benefits and drawbacks of using them as fact finding technique. Identify the situations where one is preferable over other.

3. (a) Write down the purpose of Logical Models and Physical Models. Explain with examples. Assumption may be made whenever desired.

   (b) Identify the situation where you will prefer to use Structured English, Decision Table and Decision Tree as requirements modeling technique/tool. Consider a case 'If a candidate is sharp and disciplined, take him as trainee systems analyst. If a candidate is only sharp, take him as trainee programmer; If a candidate is only disciplined, take him as Trainee console operator; If a candidate is neither sharp nor disciplined, reject him'. Draw a decision tree and decision table for this case.

   (c) A magazine is published monthly and is sent by post to its subscribers. Two months before expiry of subscription, a reminder is sent to the subscriber. If the subscription is not received within a month, another reminder is sent. If renewal subscription is not received up to two weeks before expiry of the subscription, the subscriber's name is removed from the mailing list and the subscriber is informed. Draw data flow diagram (DFD) to the appropriate level of detail.

4. (a) Explain the importance of User Centric Design (UCD). Describe how front-end design evolves from abstract level to concrete level.

   (b) What is the significance of modularity for system design? List specific characteristics of good design. Give an example of modular design and poor design.

   (c) Write down the specific differences between high level design and low level design? Identify essential activities involved at system design stage. Precisely describe each activity to clarify its purpose.

5. (a) List the main causes of software complexity. Discuss how object modeling techniques reduce s/w complexity.

   (b) What is the importance of object model in system development? Draw an object diagram by showing the relationship among the following object classes (do any one). Include association, aggregation, generalization and multiplicity as well (if needed). You may add additional object classes.

   (i) Expression, constant, variable, function, argument list, relational operator, term, factor, Arithmetic operator, statement, program.

   (ii) File system, file, directory, filename, ASCII file, executable file, directory file, disk, drive, track, sector

   (c) Critically compare object oriented development with structured approach of system development. Draw a use case diagram for a small and simple system of your choice.

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MCA (SEM-II) EXAMINATIONS – 2016-17
Microprocessor and Computer Architecture (Theory)

Time: 2 Hours   Max Marks: 75

- Write your Roll No. on the top immediately on receipt of the question paper.
- Attempt ALL questions by selecting any TWO parts. All questions carry equal marks.

1. (a) Draw and explain 8085 microprocessor architecture?

   (b) What do you understand by the term micro-operation? Explain Register and Arithmetic types of micro-operation. Show the hardware realization of decrement micro-operation. $T1: X \leftarrow X - 1$

   (c) Explain with an example, how effective address is calculated in different types of addressing modes?

2. (a) What are the various machines cycles in 8085 microprocessor? Explain any two of them with diagram.

   (b) How does a microprocessor differentiate between Data and Instruction code?

   (c) Compare assembly language with high level language. Write a program using Assembly language of 8085 microprocessor to check whether a given number is odd or even. If the given number is even then display '1' on its SOD line.

3. (a) What are the differences between isolated I/O and memory mapped I/O? Write their advantages and disadvantages also.

   (b) What are the basic advantages of using interrupt-initiated data transfer over transfer under program control without an interrupt?

   (c) Why does DMA have priority over the CPU when both request a memory transfer?

4. (a) How many times does the control unit refer to memory when it fetches and executes an indirect addressing mode instruction? If the instructions are:

      (i) A computational type requiring an operand from memory

      (ii) A branch type.

   (b) What are the differences between a branch instruction, a call subroutine instruction and program interrupt?

   (c) Multiply $(-7)_{10}$ with $(3)_{10}$ by using Booth's multiplication. Give the flow table of the multiplication.

5. (a) Describe how multiple matched words can be read out from an associative memory?

   (b) How many 128 X 8 RAM chips are needed to provide a memory capacity of 2048 bytes?

   (c) How many lines of the address bus must be used to access 2048 bytes of memory? How many of these lines will be common to all chips?

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Time: 2 Hours

Max Marks: 75

- **Write your Roll No. on the top immediately on receipt of the question paper.**

- **Attempt ALL questions by selecting any TWO parts. All questions carry equal marks.**

1. (a) Why deletion operation in Array data structure is costly? Write an algorithm to delete index[th] element from an Array data structure. Suppose that there are 3n, such that n > 3, elements in an array and we want to delete them one by one. The first 2n elements are deleted from the location index = n-2 and remaining n elements are deleted from the location index =0, by calling *del(index)* function of the Array. Calculate the total number of required move operations.

   (b) What is upper triangular matrix? Write an algorithm to get the product of two upper triangular matrices of order n, which requires minimum number of multiplication operations. Derive the formula to get the minimum number of multiplication operations in this algorithm.

   (c) What is radix sort? Write radix sort algorithm, using linked list, to sort the list of positive integers in increasing order. Illustrate the algorithm to sort following list of integers: 75, 2, 7, 13, 22, 1, 10, 8.

2. (a) What is a stack data structure? Describe its push and pop operations. Write an algorithm to convert infix expression into postfix form using stack. Convert the infix expression $(A * B + C) / (D - E)$ into postfix form using this algorithm.

   (b) What is railroad car rearrangement problem? Arrange the cars sequence [5, 8, 1, 4, 7, 2, 6, 9, 3] using minimum number of queues as holding tracks.

   (c) Describe the machine shop simulation problem? Simulate the machine shop for following jobs and also determine the finish and wait time for each job. Assume that all jobs are available at time 0 and no new jobs come during the simulation.

Job#	#Tasks	Tasks	Length
1	2	(1, 2) (2, 4)	6
2	2	(2, 4) (3, 3)	7
3	2	(2, 3) (1, 2)	5

Job Characteristics

Machine	Change-over-time
M1	2
M2	2
M3	3

Machine Characteristics

3. (a) What is binary search tree? Write an algorithm to delete a node from a binary search tree by passing the key value of the node as input parameter.

   (b) What is AVL tree? Write four AVL rotations of insertion operation. Starting with an empty AVL tree, insert the following data one by one in the given sequence. Show each insertion and AVL rotation steps.
   8, 7, 6, 5, 10, 4, 2, 9, 3, 1

   (c) What is B tree? Construct a B tree of order 4 by inserting following data one by one in given sequence. Show each splitting operation steps.
   1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18,19, 20

4. (a) What is stable sorting? Write insertion sort algorithm to sort list of integers in non increasing order. Derive the formula to get minimum and maximum number of comparison operations.

   (b) Like binary search, we can device ternary search algorithm. In this the sorted list is divided in three equal sub lists and key is to be search may exist in one of them. Write ternary search algorithm to search a key in a sorted list and determine the maximum number of possible comparisons.

   (c) Describe the primary clustering problem in linear probing, that may used to resolve collision in hash table, and how is it solve by using random probing. Assume that there is a hash table of size 11, hash function is $H(k) = k \% 11$, and m = 5 is used to generate the pseudo random number. Build the hash table by inserting keys: 1, 12, 24, 34, 46 one by one.

5. (a) What is a complete bi-partite undirected graph $K_{m,n}$? Determine the total degree and total number of edges in a complete bipartite undirected graph $K_{20,30}$.

   (b) What is spanning tree? Determine the total number of spanning trees of complete bi-partite graph $K_{2,2}$.

   (c) What is a complete graph K_n? Determine the total number of edges in a complete graph K_5 of 5 vertices and also represent it using adjacency matrix and adjacency list.

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CBCS for PG (SEM-II) EXAMINATIONS – 2016-17
Operating Systems (Theory)

Time: 2 Hours   **Max Marks: 75**

- Write your Roll No. on the top immediately on receipt of the question paper.
- Attempt ALL questions by selecting any TWO parts. All questions carry equal marks.

1.   (a)   Differentiate among single processor, multiprocessor and clustered systems. Give example of each.

(b)   Why would an application programmer prefer programming according to an API rather than invoking actual system calls? Illustrate the relationship between API and system calls with suitable example.

(c)   Take an example of an operating system and discuss a methodology for designing it using modular kernel approach.

2.   (a)   Construct a tree of processes (upto user level) on a Solaris system and give explanation of each parent child processes.

(b)   Illustrate the convoy effect and starvation issues and their solutions in process scheduling using examples.

(c)   Consider the following snapshot of a system. Give a procedure to find out that the given system in a safe state or not.

	Allocation	Max	Available
	A B C D	A B C D	A B C D
P0	0 0 1 2	0 0 1 2	1 5 2 0
P1	1 0 0 0	1 7 5 0	
P2	1 3 5 4	2 3 5 6	
P3	0 6 3 2	0 6 5 2	
P4	0 0 1 4	0 6 5 6	

3.   (a)   Define dynamic storage allocation problem and give a solution for the same.

(b)   If FIFO page replacement is used with four page frames, how many page faults will occur with the reference string 0172327103 if the four frames are initially empty? Now repeat this problem for LRU.

(c)   If a process is spending more time on paging than executing, results in severe performance problems of a system. Illustrate this phenomenon and its solution.

4.   (a)   An access- matrix scheme provides mechanism for specifying a variety of security policies concerning protection. What are these policies and give implementation of these policies using access-matrix.

(b)   Write short notes on Trojan horse, and stack & buffer overflow attack.

(c)   Give a system with three protection domains. Use the given system for implementing need – to – know

security principle.

5.   (a)   The file **sample** has the permission, rwxr --xr-x. What are the permissions after the following command?

chmod u-x, g+w, o-x **sample**, chmod 444 **sample**

(b)   Distinguish between a sequence of commands, a group of commands, and a chain of commands formats in a Unix shell with suitable examples.

(c)   Compare and contrast the **head, tail** and the **cut** commands in Linux.

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