D 93223 **(Pages : 2)** **Name.....**

Reg. No.....

FIRST SEMESTER M.Sc. DEGREE (SUPPLEMENTARY) EXAMINATION NOVEMBER 2020

(CUCSS)

Computer Science

CSS 1C 01—DISCRETE MATHEMATICAL STRUCTURE

(2014 Admissions)

Time : Three Hours Maximum : 36 Weightage

Section A

Answer **all** *questions.*

Each question carries 1 *weightage.*

1. Find the dual of $(A \cup B) \cap (A \cup C)$.
2. Write any application of inclusion-exclusion principle.
3. Define symmetric relation.
4. Give an example of a partially ordered set.
5. What is Boolean Lattice ?
6. How do you represent Boolean function ?
7. What is a Subgroup ?
8. How many properties can be held by a group ?
9. Define Digraph.
10. Draw a regular bipartite graph.
11. Define a tree. Give example.
12. Define Antisymmetric relation.

(12 × 1 = 12 weightage)

Section B

Answer any **six** *questions.*
Each question carries 2 *weightage.*

13. What are the two types of quantifiers ? Give examples.

14. List the rules for defining Well-formed formula. Give an example of WFF.

15. Let A = {1, 2, 5, 10} with the relation divides. Draw the Hasse diagram.

16. Define partial ordering on S.

17. Write short notes oi Homomorphism and Isomorphism.

18. Define Lattice. What are the properties of lattice ?

19. List out properties of group.

20. Define complete bipartite graph with example.

21. Define Eulerian and Hamilton graph. Give an example of a graph which is Eulerian but not Hamiltonian.

(6 × 2 = 12 weightage)

Section C

Answer any **three** *questions.*
Each question carries 4 *weightage.*

22. Show that the statement $(p \vee q) \wedge [(\sim p) \wedge (\sim q)]$ is a contradiction.

23. Discuss the properties of relations. Explain reflexive, symmetric and transitive closure of relations. Give one example each.

24. Discuss Boolean algebra with examples.

25. If G_1 and G_2 be subgroup of a group G then show that G_1, G_2 is also a subgroup of G.

26. Illustrate Dijkstra's algorithm with suitable example.

27. Simplify the following Boolean expression : $(a * b)$.

(3 × 4 = 12 weightage)

D 93224 **(Pages : 2)** **Name.....**

Reg. No.....

FIRST SEMESTER M.Sc. DEGREE (SUPPLEMENTARY) EXAMINATION NOVEMBER 2020

(CUCSS)

Computer Science

CSS 1C 02—ADVANCED DATA STRUCTURE

(2014 Admissions)

Time : Three Hours Maximum : 36 Weightage

Section A

Answer **all** *questions.*

Each question carries 1 *weightage.*

1. What is an algorithm ? How its complexity is analysed ?
2. What is meant by data structure ?
3. What is sparse matrix ?
4. What is stack ? Mention the different operations on stack.
5. What is circular linked list ?
6. Define dequeue.
7. Draw a full binary tree with at least six nodes.
8. What is M-way tree ?
9. Define the transitive closure of a graph.
10. What do you mean by hash function ?
11. What is binary heap ? Give any *one* application.
12. What are splay trees ?

(12 × 1 = 12 weightage)

Section B

Answer any **six** *questions.*

Each question carries 2 *weightage.*

13. Explain binary search algorithm ? Give its best-case and worst-case time complexity.
14. Explain the implementation of queue using arrays.

Turn over

15. Write an algorithm to count the number of nodes in a Singly Linked List.
16. What is a priority queue ? Explain the different ways of representing them.
17. Draw a binary tree for the expression : A * B – (C + D) * (P/Q).
18. Write recursive algorithm to perform in order traversal of a binary tree.
19. Differentiate between B-Tree and B + Tree.
20. What is pairing heaps ? Explain how it works.
21. Write a short note on Binomial Amortized Analysis.

(6 × 2 = 12 weightage)

Section C

Answer any **three** *questions.*
Each question carries 4 *weightage.*

22. What is doubly linked list ? Give an algorithm for adding a node at the beginning of the doubly linked list.
23. Explain Breadth First Search traversal of Graph using an example.
24. Explain the different operations on Binary Search Tree.
25. What is a binary trie ? Construct a binary trie with elements : 0001, 0011, 1000, 1001, 1100, 0010, 1101,1010.
26. Explain max-heap construction algorithm with suitable example.
27. Given input keys {1, 3, 23, 9, 4, 29, 19} and a hash function h (X) = X *mod tablesize*. The initial hash table contains 10 slots, with starting index 0. Show the resulting table after rehashing when the load factor = 0.5, using linear probing.

(3 × 4 = 12 weightage)

D 93225 **(Pages : 2)** **Name**.....

Reg. No.....

FIRST SEMESTER M.Sc. DEGREE (SUPPLEMENTARY) EXAMINATION NOVEMBER 2020

(CUCSS)

Computer Science

CSS 1C 03—THEORY OF COMPUTATION

(2014 Admissions)

Time : Three Hours Maximum : 36 Weightage

Section A

Answer **all** *questions.*
Each question carries 1 *weightage.*

1. Define Finite Automata.
2. Define NFA with Epsilon transition.
3. What are the closure properties of regular language ?
4. What do you mean by homomorphism ?
5. What are the different types of language accepted by a PDA and define them ?
6. What is meant by Greibach Normal Form ?
7. List out the different techniques for Turing machine construction.
8. What is church thesis ?
9. Define Halting problem.
10. What is post correspondence problem ?
11. State when a grammar is said to be ambiguous.
12. Define extended transition function for a DFA.

(12 × 1 = 12 weightage)

Section B

Answer any **six** *questions.*
Each question carries 2 *weightage.*

13. What are the applications of Automata Theory ?
14. Explain the different forms of proof with examples.

15. Give regular expression for the following :

    L1 = set of all strings of 0 and 1 ending in 00.

    L 2 = set of all strings 0 and 1 beginning with 0 and ending 1.

16. Write down the context free grammar for the language $\{ \}1 | \geq = n\ b\ a\ \mathrm{L}\ n\ n.$

17. What are the additional features of PDA compared with NFA.

18. Find a grammar in Chomsky normal form equivalent to.

19. Explain multi-tape Turing machine.

20. Explain Cook's theorem.

21. Explain that AMBIGUITY problem is un-decidable.

(6 × 2 = 12 weightage)

Section C

Answer any **three** *questions.*
Each question carries 4 *weightage.*

22. Explain the extended transition function for NFA, DFA and $\in$ –NFA . Give the regular expressions for set of all strings that begin with 110.

23. State and prove the pumping lemma for the regular languages.

24. Convert the given NFA to DFA and draw the transition table :

δ	0	1
	{	
*	ϕ	

25. Design a Turing machine to accept the language and simulate its action on the input 0011.

26. Construct a push down automata to accept the language by empty stack and final state.

27. Explain i) polynomial time reductions.

    ii) NP completeness.

    iii) NP hard problems.

(3 × 4 = 12 weightage)

D 93226 **(Pages : 2)** **Name.....**

Reg. No.....

FIRST SEMESTER M.Sc. DEGREE (SUPPLEMENTARY) EXAMINATION NOVEMBER 2020

(CUCSS)

Computer Science

CSS 1C 04—THE ART OF PROGRAMMING METHODOLOGY

(2014 Admissions)

Time : Three Hours Maximum : 36 Weightage

Section A

Answer **all** *questions.*
Each question carries 1 *weightage.*

1. What is a flow chart ?
2. What is top-down design ?
3. Differentiate between syntax error and run-time errors in a program.
4. What are the fundamental data types in C ?
5. What are conditional operators ?
6. Explain the syntax and function in of **if.else** construct in C.
7. Explain the use of *switch* statement it in C.
8. How will you by pass certain statements in a loop construct in C ?
9. What are the different types of functions in C ?
10. Explain Array of Structure,
11. What is the use of **realloc( )** functions in C ?
12. What are command line arguments.

(12 × 1 = 12 weightage)

Section B

Answer any **six** *questions.*
Each question carries 2 *weightage.*

13. Explain the different characteristics of an algorithm.
14. Explain any *four* I/O functions in C ?

15. Explain any *four* string handling functions in C.
16. Give an account on storage classes in C.
17. Explain how you will declare a pointer to a function with suitable example.
18. Write a C program to find the trace (sum of all diagonal elements) of a matrix.
19. Illustrate the memory allocation of structure and union in C with example.
20. What is FILE data structure ? Explain the different file access modes supported in C.
21. Write a short note on pre-processor directives.

(6 × 2 = 12 weightage)

Section C

Answer any **three** *questions.*

Each question carries 4 *weightage.*

22. Explain the syntax and functions of standard I/O functions in C with examples.
23. Explain the different loop construct available in C with suitable examples.
24. Explain the differences between call-by-value and call-by-reference with suitable examples.
25. Write a C program to multiply two suitable matrices.
26. Explain Array of Structure with suitable examples.
27. Define a macro with one parameter to compute the volume of a sphere. Write program using this macro to compute the volume for spheres of radius 5, 10 and 15 meters.

(3 × 4 = 12 weightage)

FIRST SEMESTER M.Sc. DEGREE (SUPPLEMENTARY) EXAMINATION NOVEMBER 2020

(CUCSS)

Computer Science

CSS 1C 05—COMPUTER ORGANIZATION AND ARCHITECTURE

(2014 Admissions)

Time : Three Hours Maximum : 36 Weightage

Section A

Answer **all** *questions.*
Each question carries 1 *weightage.*

1. Define logic gates. Name the different types of logic gates.
2. Draw block diagram of a combinational circuit.
3. Define machine Instructions. Also give the format of the same.
4. Briefly explain the type of micro instruction.
5. How are negative numbers handled in an arithmetic processor ? What are the different ways of representing negative fixed point binary numbers ?
6. Define a fast adder. What is it use ?
7. What are the types of memory ? briefly describe each.
8. Define DMA with its major function.
9. What is a hardware interrupt ?
10. List any *two* opcodes used for data transfer in 8085 microprocessors.
11. What are the features of 8051 microcontroller ?
12. Define flip flops. What are the different types of flip flops available ?

(12 × 1 = 12 weightage)

Section B

Answer any **six** *questions.*
Each question carries 2 *weightage.*

13. Draw the Truth table and logic diagram for F = $x + y'z$.
14. What are the different phase of an instruction cycle in a computer ?

15. Name any *three* differences between single bus and double bus structure.
16. Briefly explain the division of two fixed-point numbers in signed magnitude representation with an example.
17. Differentiate RAM and ROM that least two advantages each.
18. What is programmed I/O and how does it work ?
19. Explain the features of 8086.
20. Define an error detection code. What is the most common error detection code ?
21. List the different types of machine cycles in 8085.

(6 × 2 = 12 weightage)

Section C

Answer any **three** *questions.*
Each question carries 4 *weightage.*

22. Explain any *two* error detection and error correction codes.
23. Briefly explain the different addressing modes.
24. What are the classifications of machine instruction ?' Explain each with an example.
25. Explain the hardware implementation of Booth's algorithm with a diagram.
26. How does data transfer to and from the peripherals take place ? Briefly explain.
27. Briefly explain the different addressing modes used in 8085.

(3 × 4 = 12 weightage)

D 93395 **(Pages : 4)** **Name.....**

Reg. No.....

FIRST SEMESTER M.Sc. (COMPUTER SCIENCE) DEGREE EXAMINATION, NOVEMBER 2020

(CBCSS)

CSS 1C 01—DISCRETE MATHEMATICAL STRUCTURES

(2019 Admissions)

Time : Three Hours Maximum : 30 Weightage

General Instructions

1. *In cases where choices are provided, students can attend* **all** *questions in each section.*
2. *The minimum number of questions to be attended from the Section / Part shall remain the same.*
3. *There will be an overall ceiling for each Section / Part that is equivalent to the maximum weightage of the Section / Part.*

Section A

Answer any **four** *questions.*

Each question carries 2 *weightage.*

1. Solve using set theory : Among 60 students in a class, 28 got class I in SEM I and 31 got class I in SEM II. If 20 students did not get class I in either Semesters, how many students got class I in both the Semesters ?
2. Define Well Formed Formula. Give an example of a formula which is not a Well Formed formula.
3. State and explain the principle of Duality for Lattices.
4. Define Rings and Fields.
5. Define closure of a relation.
6. State Pigeon hole principle.
7. Define subgraphs, paths and circuits.

(4 × 2 = 8 weightage)

Section B

Answer any **four** *questions.*
Each question carries 3 *weightage.*

8. Define Tautology. Give an example of Tautology. Prove / disprove the following :

   (i) $(P \to Q) \wedge (R \to Q) \Leftrightarrow (P \vee R) \to Q$.

   (ii) $P \to (Q \to P) \Leftrightarrow \sim P \to (P \to Q)$.

   (iii) $\sim (P \leftrightarrow Q) \Leftrightarrow (P \vee Q) \wedge \sim (P \wedge Q)$.

   (iv) $\sim (P \leftrightarrow Q) \Leftrightarrow (P \wedge \sim Q) \vee (\sim P \wedge Q)$.

9. (i) Write the following statements in the symbolic form :

   (a) All men are bad.

   (b) No men are bad.

   (c) Some men are good.

   (d) If any one is bad Raj is bad.

   (ii) Indicate the variables that are free and bound.

   (a) $(\forall x)(P(x) \to R(x)) \to (\forall x) P(x) \wedge R(x)$.

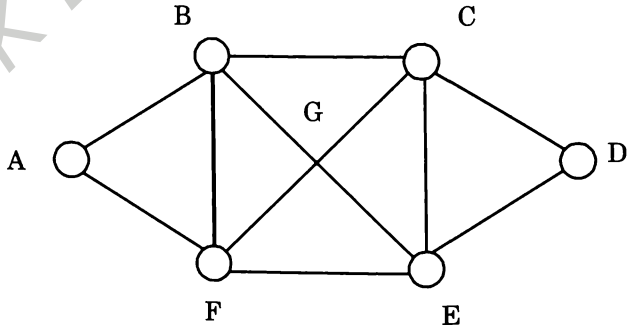
   (b) $(\forall x)(P(x) \wedge (\exists x) Q(x)) \vee ((\forall x) P(x) \to Q(x))$.

10. Define Boolean algebra. Boolean functions and Boolean expressions. Give examples.

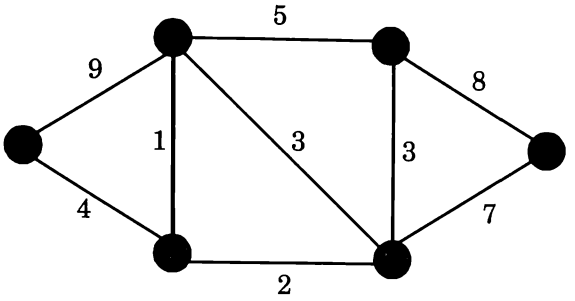
11. Write notes on Permutation Groups and Cyclic Groups.

12. Explain composition of relations with an example.

13. Define Euler path and circuits. Find Euler circuit in the following graph:



14. Find Minimum Spanning Tree using Kruskal's algorithm.



(4 × 3 = 12 weightage)

Section C

Answer any **two** *questions.*
Each question carries 5 *weightage.*

15. (i) Define Distributive Lattices and Complemented Lattices. Give examples.

(ii) Show that a Lattice is distributive if and only if for any elements a, b and c in the Lattice, $(a \vee b) \wedge c \leq a \vee (b \wedge c)$.

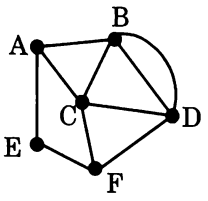
16. (i) Explain Isomorphism. Show that every group containing exactly two elements is isomorphic to $(Z_2, \oplus)$.

(ii) Explain Monoid with example.

17. (i) Let R be a symmetric and transitive relation on a set A. Show that if for every a in A there exists b in A such that (a, b) is in R, then R is an equivalence relation,

(ii) If $f(x) = x^2 - 4x + 2$ and $g(x) = 3x - 7$ find.

18. Identify Euler path, Euler Circuit, Hamiltonian path and Hamiltonian circuit, If exist. If not, explain the reason.



(2 × 5 = 10 weightage)

D 93396 **(Pages : 2)** **Name.....**

Reg. No.....

FIRST SEMESTER M.Sc. DEGREE REGULAR/SUPPLEMENTARY EXAMINATION, NOVEMBER 2020

(CBCSS)

Computer Science

CSS 1C 02—ADVANCED DATA STRUCTURES

(2019 Admissions)

Time : Three Hours Maximum : 30 Weightage

General Instructions

1. *In cases where choices are provided, students can attend* **all** *questions in each section.*
2. *The minimum number of questions to be attended from the Section / Part shall remain the same.*
3. *There will be an overall ceiling for each Section / Part that is equivalent to the maximum weightage of the Section / Part.*

Section A

Answer any **four** *questions.*
Each question carries 2 *weightage.*

1. Write an algorithm to find the largest number in a list of n integers and comment on its time complexity.
2. Explain the working principle of any *one* of the following sort algorithms (Insertion, Bubble, Selection).
3. What is a recursive list ?
4. Define Binary search tree. Draw a sample BST.
5. Explain the need for balancing a search tree.
6. Explain the concept of linear probing.
7. What is a Heap ?

(4 × 2 = 8 weightage)

Section B

Answer any **four** *questions.*
Each question carries 3 *weightage.*

8. Discuss the objectives and desirable characteristics of an algorithm.

Turn over

9. Write algorithms for the following operations on singly linked list :

   (i) To reverse the list.

   (ii) To concatenate list.

   (iii) To delete all nodes.

10. With suitable example explain an efficient representation for sparse matrix.

11. Explain the different graph representation schemes.

12. Write a note on Tries.

13. Explain the properties of Min-max heaps. Highlight applications of Min-Max heaps.

14. Compare binary heap with Fibonacci heaps.

(4 × 3 = 12 weightage)

Section C

Answer any **two** *questions.*
Each question carries 5 *weightage.*

15. Write necessary functions for the implementation of stack data structure as a linked list. Illustrate with example, the steps in the conversion of an infix expression to postfix, using the data structure Stack.

16. Explain the properties of Red-Black tree. Illustrate with figures, the steps in the insertion of the following numbers, into an empty Red-Black tree.

    2, 1, 4, 5, 9, 3, 6, 7.

17. Explain implementation of double hashing algorithms. Discuss the need and steps in rehashing and extendable hashing.

18. What is a Binomial heap ? Give examples. Explain the operations performed on Binomial heaps. Highlight any one application of Binomial heap.

(2 × 5 = 10 weightage)

D 93397 **(Pages : 3)** **Name.....**

Reg. No.....

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2020

(CBCSS)

Computer Science

CSS 1C 03—THEORY OF COMPUTATION

(2019 Admissions)

Time : Three Hours Maximum : 30 Weightage

General Instructions

1. *In cases where choices are provided, students can attend* **all** *questions in each section.*
2. *The minimum number of questions to be attended from the Section / Part shall remain the same.*
3. *There will be an overall ceiling for each Section / Part that is equivalent to the maximum weightage of the Section / Part.*

Section A

Answer any **four** *questions.*

Each question carries 2 weightage.

1. Define Alphabets, Strings and Languages.
2. Draw a DFA which accepts strings of the form abc*a(bc)*a.
3. Define regular expression. Write regular expression for all strings over {0, 1} ending in '11' and contain at least one '0'.
4. Explain the Classes P and NP.
5. Define Push Down Automata.
6. Define context sensitive Languages.
7. Explain Multi-tape Turing machine.

(4 × 2 = 8 weightage)

Turn over

Section B

Answer any **four** *questions.*

Each question carries 3 *weightage.*

8. Design NFA and DFA which recognizes the language over {a – z} and accepts the strings ending in 's' or 'ed' or 'ing'.

9. Prove that every language defined by a regular expression is also defined by a Finite Automation.

10. Explain the following closure properties of regular languages :

    Closure under complementation, Union and Intersection.

11. Explain "Satisfiability Problem".

12. Write a note on Halting problem.

13. List and explain closure properties of Context Free Languages.

14. Comment on the Equivalence of Type 0 grammar with Turing Machines.

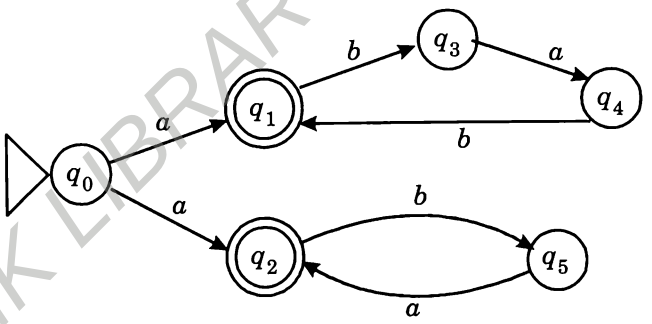
(4 × 3 = 12 weightage)

Section C

Answer any **two** *questions.*

Each question carries 5 *weightage.*

15. Illustrate NFA to DFA conversion using the following example :



16. Illustrate DFA state minimization with suitable example.

17. Define CNF and GNF. Give examples. Perform the following, in the order given, on the following grammar :

Eliminate and productions, eliminate any unit productions, Eliminate useless symbols and put the resulting Grammar into Chomsky Normal Form :

$S \rightarrow 0A0 \mid 1B1 \mid BB$

$A \rightarrow C$

$B \rightarrow S \mid A$

$C \rightarrow S \mid \varepsilon$

18. Define Turing Machine and Language of a Turing machine. Explain Instantaneous Descriptions and transition diagrams for Turing Machines with suitable examples.

(2 × 5 = 10 weightage)

D 93398 **(Pages : 2)** **Name**.....

Reg. No.....

FIRST SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, NOVEMBER 2020

(CBCSS)

Computer Science

CSS 1C 04—THE ART OF PROGRAMMING METHODOLOGY

(2019 Admissions)

Time : Three Hours Maximum : 30 Weightage

General Instructions

1. *In cases where choices are provided, students can attend* **all** *questions in each section.*
2. *The minimum number of questions to be attended from the Section / Part shall remain the same.*
3. *There will be an overall ceiling for each Section / Part that is equivalent to the maximum weightage of the Section / Part.*

Section A

I. Short Answer Type Questions. Answer any *four* questions :

1 Write a program to read *n* integers into an array. Find the largest and smallest number.

2 Write a program to print product of digits of any number

(input : 235, output: 5 * 3 * 2 = 30).

3 What are actual and formal arguments ? Explain with example.

4 Differentiate between Structure and Union.

5 What is Recursion ? Explain its advantages.

6 What is a linked list ?

7 Distinguish between static and external variables.

(4 × 2 = 8 weightage)

Section B

II. Short Essays *or* Problem Solving Type. Answer any *four* questions :

8 List any *five* library functions and illustrate them with suitable examples.

9 Write a program to concatenate two strings without the use of library functions.

Turn over

10 Illustrate the steps in creating a data file.

11 Give the syntax of while and for constructs. Illustrate the use of break and continue statements.

12 Write a program to read a five digit number and square each digits and form a new number as illustrated below:

Input : 45252, Output : 16254254).

13 Demonstrate with suitable example, how a loop is constructed in flow chart.

14 Write a program to read any three characters and print all possible combinations of the characters.

(4 × 3 = 12 weightage)

Section C

III. Long Essay Type Questions. Answer any *two* questions :

15 What do you mean by command line arguments ? Write a program to find the sum and average of n numbers using command line arguments.

16 Write a program to sort n strings in ascending order using pointers.

17 Write a program to insert a new number into a sorted integer array.

18 Demonstrate the following: pointer-to-pointer, array of pointers, constant pointer, array of pointers, pointer arithmetic.

(2 × 5 = 10 weightage)

D 93399 **(Pages : 2)** **Name.....**

Reg. No.....

FIRST SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, NOVEMBER 2020

(CBCSS)

Computer Science

CSS 1C 05—COMPUTER ORGANIZATION AND ARCHITECTURE

(2019 Admissions)

Time : Three Hours Maximum : 30 Weightage

General Instructions

1. *In cases where choices are provided, students can attend* **all** *questions in each section.*
2. *The minimum number of questions to be attended from the Section / Part shall remain the same.*
3. *There will be an overall ceiling for each Section / Part that is equivalent to the maximum weightage of the Section / Part.*

Section A

Answer any **four** *questions.*

Each question carries 2 weightage.

1. Give truth tables for NAND and NOR gates. Show that AND-OR circuit is equivalent to NAND-NAND.
2. Explain how parity bits help in error detection.
3. Explain the steps in a memory READ operation.
4. How will you convert a Full Adder to a Sub-tractor ?
5. Differentiate between cache memory and virtual memory.
6. Give and explain examples of Direct Addressing and Register Indirect Addressing, from 8085 instruction set.
7. Draw 8085 Flag Register and give the significance of each bit.

(4 × 2 = 8 weightage)

Section B

Answer any **four** *questions.*

Each question carries 3 *weightage.*

8. Explain Floating point number representation.
9. Outline the working of 4-to- l multiplexer with suitable diagram.
10. Identify the steps in the execution of a branch instruction.
11. With a block diagram, illustrate working of array multiplier.
12. Explain different algorithms for cache memory replacement (any *three*), highlighting their merits and limitations.
13. Discuss Vectored interrupts and interrupt nesting.
14. Outline 8086 register organization.

(4 × 3 = 12 weightage)

Section C

Answer any **two** *questions.*

Each question carries 5 *weightage.*

15. With the help of block diagrams, explain two bus and three bus organization of processors.
16. Explain steps in non-restoring division algorithm. Illustrate the algorithm with suitable example.
17. Explain in detail organization and working of a virtual memory system.
18. Discuss 8051 architecture.

(2 × 5 = 10 weightage)

D 93573 **(Pages : 2)** **Name**.....

Reg. No.....

FIRST SEMESTER P.G. DEGREE EXAMINATION, NOVEMBER 2020

(CCSS)

Computer Science

CSC 1C 01—DISCRETE MATHEMATICAL STRUCTURES

(2019 Admissions)

Time : Three Hours Maximum : 80 Marks

Answer any **five** *full questions.*

1. A) If p and q are primitive statements, prove that

$(\sim p \vee q) \wedge (p \wedge (p \wedge q)) \Leftrightarrow (p \wedge q)$.

(5 marks)

B) Verify that $p \wedge q \wedge \sim p$ is a contradiction and $p \to q \leftrightarrow -p \vee q$ is a tautology. (6 marks)

C) Show that $(\exists x)(P(x) \wedge Q(x)) \Rightarrow (\exists x)P(x) \wedge (\exists x)Q(x)$. (5 marks)

2. A) A computer company wants to hire 25 programmers to handle systems programming jobs and 40 programmers for applications programming. Of those hired, ten will be expected to perform jobs of both types. How many programmers must be hired ?

(5 marks)

B) Let A = { 1, 2, 3, 4} be a set and a relation R is defined on A such that aRb if $a \geq b$. Check if R is : (i) reflexive ; (ii) symmetric ; (iii) transitive ; (iv) asymmetric.

(5 marks)

C) Define Hasse diagram. Draw the Hasse diagram for :

(i) P_1 = {1, 2, 3, 4, 12} and $\leq$ is a relation such that $x \leq y$ if x divides y.

(ii) Let S = {a, b, c} and P(S) = {ϕ, {a}, {b}, {c}, {a, b}, {a, c}, {b, c}, {a, b, c}} Consider the partial order of set inclusion $(\subseteq)$.

(6 marks)

3. A) Find the domain for which the function $f(x) = 3x^2 - 1$ and $g(x) = 1 - 5x$ are equal. Also find a domain for which the functions are not equal.

(4 marks)

B) Explain different types of functions with example.

If f : R -> R is a function such that $f(x) = 3x + 5$, prove that f is one-one onto. (7 marks)

Turn over

C) State Pigeon hole principle. Using Pigeon hole principle, show that in any group of 30 people, we can always find 5 people who were born on the same day of the week.

(5 marks)

4. A) Prove that the necessary and sufficient condition for a nonempty subset H of a group (G, *) to be a subgroup of G if $a,b \in H \Rightarrow a * b^{-1} \in H$.

(5 marks)

B) State and prove the fundamental theorem of group homomorphism. (5 marks)

C) Write a note on Cosets. (6 marks)

5. A) Prove that the maximum number of edges in a simple graph with n vertices is $\frac{n(n-1)}{2}$.

(5 marks)

B) Define complete bipartite graph with example. Draw a complete bipartite graph of $K_{2,3}$ and $K_{3,3}$.

(5 marks)

C) Explain Kruskal's and Prim's algorithm. (6 marks)

6. A) Under what conditions on sets A and B is

$A \times B = B \times A$.

Also show that $A \times (B \cap C) = (A \times B) \cap (A \times C)$ (6 marks)

B) State and prove Distributive properties of set operations. (5 marks)

C) Apply Demorgan"s theorem to the following expression

(i) $\overline{(x+\bar{y})(\bar{x}+y)}$.

(ii) $\overline{(a+b+c)d}$ (5 marks)

7. A) Prove the following equivalences by proving the equivalences of the dual

$\neg((\neg P \wedge Q) \vee (\neg P \wedge \neg Q)) \vee (P \wedge Q) \equiv P$. (5 marks)

B) Obtain PCNF and PDNF of the formula $(\neg P \vee \neg Q) \rightarrow (P \leftrightarrow \neg Q)$ (5 marks)

C) Define converse, inverse and contrapositive of the statement. Give example.

8. Write a note on the following :

A) Functions and Inverse functions.

B) Isomorphism groups.

C) Representation of graphs.

D) Rings.

(16 marks)

D 93574 **(Pages : 2)** **Name**.....

Reg. No.....

FIRST SEMESTER P.G. DEGREE EXAMINATION, NOVEMBER 2020

(CCSS)

Computer Science

CSC 1C 02—ADVANCED DATA STRUCTURES AND ALGORITHMS

(2019 Admissions)

Time : Three Hours Maximum : 80 Marks

Answer any **five** *full questions.*

1. A) What do you mean by data abstraction ? Explain the different abstract data types.

   B) Write down the binary search algorithm. Also specify its complexity.

   (8 + 8 = 16 marks)

2. A) What is doubly linked list ? Write an algorithm to insert a node in the middle of doubly linked list.

   (8 marks)

   B) Write an algorithm for converting Infix expression into Postfix expression. (8 marks)

3. A) Construct a tree for the given inorder and postorder traversals.

   Inorder : DGBAHEICF.

   Postorder : GDBHIEFCA.

   (8 marks)

   B) What is Binary Tree ? Explain Representation of Binary tree. Also explain different operation that can be performed on Binary tree.

   (8 marks)

4. A) Explain the implementation of double hashing algorithm. (8 marks)

   B) Give an account on hash function and its computation. (8 marks)

5. A) What is Graph ? Explain matrix and linked list representation of a graph. (8 marks)

   B) Explain Heap sort algorithm with example. (8 marks)

6. A) Explain the different operations on stack. (8 marks)

   B) Apply quick sort to the list 5, 3, 1, 9, 8, 2, 4, 7. (8 marks)

Turn over

7. A) What do you mean by Array ? Describe the storage structure of Array. Also Explain various types of Arrays in detail. (6 marks)

   B) What is Hashing ? Explain different Hashing methods. (6 marks)

   C) Write a short note on Splay Tree. (6 marks)

8. A) What is spanning tree ? Explain minimum spanning tree with examples. (6 marks)

   B) What is circular queue ? Explain its represented using arrays. (6 marks)

   C) Write a short note on sparse matrix. (4 marks)

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Reg. No.....

FIRST SEMESTER P.G. DEGREE EXAMINATION, NOVEMBER 2020

(CCSS)

Computer Science

CS 1C 03—PRINCIPLES OF PROGRAMMING METHODOLOGY

(2019 Admissions)

Time : Three Hours Maximum : 80 Marks

Answer any **five** *full questions.*

1. A) Explain the characteristics of a good program. (5 marks)

   B) What is a flowchart ? List out the different symbols used in a Flowchart. (6 marks)

   C) What are the different types of programming errors ? Explain. (5 marks)

2. A) Explain the syntax and function of standard I/O functions in C with examples.

   B) Compare and contrast else..if ladder and switch statement in C. (8 + 8 = 16 marks)

3. A) Write a C program to swap two numbers using call-by-reference method. (8 marks)

   B) What are the different types of arrays in C ? Illustrate each one with example. (8 marks)

4. A) What do you mean by structure variable in C ? Explain the differences between array of structure and structure of array.

   B) What is pointer variable ? Explain the different arithmetic operations on pointers.

   (8 + 8 = 16 marks)

5. A) What is a FILE data structure ? Explain the different operations on files. (8 marks)

   B) Write a program that reads a file containing integers and appends at its end the sum of all the integers.

   (8 marks)

6. A) What are the different categories of user defined functions in C ? Explain each one with suitable example.

   (8 marks)

Turn over

B) Explain the similarities and differences between structure and union variables in C with suitable examples.

(8 marks)

7. A) What is algorithm ? Explain the different criteria that is to be satisfied by an algorithm.

B) Write a C program to generate n Fibonacci numbers using recursion.

(8 + 8 = 16 marks)

8. A) Explain auto, register, extern, static variables in C. Also illustrate each with suitable example.

(8 marks)

B) Explain the differences between call-by-value and call-by-reference mechanism in C with suitable examples.

(8 marks)

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FIRST SEMESTER P.G. DEGREE EXAMINATION, NOVEMBER 2020

(CCSS)

Computer Science

CS 1C 04—THEORY OF COMPUTATION

(2019 Admissions)

Time : Three Hours Maximum : 80 Marks

Answer any **five** *full questions.*

1. A) Explain briefly the equivalence between the two automata. (8 marks)

   B) Find a DFA that accepts all the strings on {0, 1}, except those containing the substring 001. (8 marks)

2. A) Define Context Free Grammar with an example. (8 marks)

   B) "In an unambiguous grammar, leftmost derivations will be unique". Prove this statement with an example. (4 marks)

   C) What are the different causes of ambiguity in the grammar ? (4 marks)

3. Differentiate the following :

   A) PDA and Regular language.

   B) PDA and CFG.

   C) DPDA and Non-DPDA.

   D) CFG and CSG.

   (4 × 4 = 16 marks)

4. A) Define a Turing Machine. What are the different notations used for the same ? (8 marks)

   B) Briefly explain Universal Turing Machine. (8 marks)

5. A) "A language L, is said to be recursively enumerable if there exists a,Turing machine that accepts it". Explain. (8 marks)

   B) Briefly explain the complexity classes P and NP. (8 marks)

6. A) Show that a regular language cannot be inherently ambiguous. (8 marks)

   B) Briefly explain the closure properties of Regular languages. (8 marks)

Turn over

7. A) Is it possible that the question P = NP is undecidable ? Explain. (8 marks)

   B) Write short notes on :

      i) Multistack Turing machine.

      ii) Multitape Turing machine.

(8 marks)

8. A) Show that the language $L = \{a^n : n \geq 0\}$ is not context free. (8 marks)

   B) Explain how Transition of a Turing machine can be represented pictorially. (8 marks)

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Reg. No.....

FIRST SEMESTER P.G. DEGREE EXAMINATION, NOVEMBER 2020

(CCSS)

Computer Science

CS 1C 05—COMPUTER ORGANIZATION AND ARCHITECTURE

(2019 Admissions)

Time : Three Hours Maximum : 80 Marks

Answer any **five** *full questions.*

1. A) (i) Subtract $(1010100)_2$ from $(1000011)_2$ using 2's complement.

   (ii) Simplify $f(A, B, C) = \sum (1, 4, 5, 6, 7)$.

   (iii) Convert $(FA3)_{16} = (\_\_\_\_\_)_{10}$.

   (3 + 5 + 2 = 10 marks)

   B) Draw and explain the function of 1 × 4 Demultiplexer. (6 marks)

2. A) Explain Booth algorithm for binary multiplication. (8 marks)

   B) Explain non-restoring division algorithm for unsigned integers with an example. (8 marks)

3. A) Explain the organization and functions of typical hardwired control unit. (10 marks)

   B) Explain the execution of instruction with a diagram. (6 marks)

4. A) Explain the need of memory hierarchy technology with four level memory. (6 marks)

   B) Discuss the DMA operations with neat diagram. (10 marks)

5. A) Explain the architecture of 8086 microprocessor with a block diagram. (10 marks)

   B) What is an assembly language program ? Explain the different elements of an assembly language programme.

   (6 marks)

6. A) What is a flip-flop ? Show the logic implementation of RS flip-flop having active-High R and S inputs. Draw its truth table and mark the invalid entry.

   (8 marks)

   B) Explain the organization of RAM. (8 marks)

Turn over

7. A) Explain the use of vectored interrupts in process. Why is priority handling desired in interrupt controllers' ? I low does the different priority scheme work' ?

(8 marks)

B) Draw the block diagram of the hardware implementation of addition and subtraction of signed numbers.

(8 marks)

8. A) What is an addressing mode ? Explain any three addressing modes with suitable Examples.

(8 marks)

B) Give an account on I/O interfaces. (8 marks)