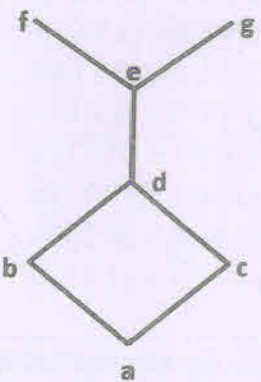




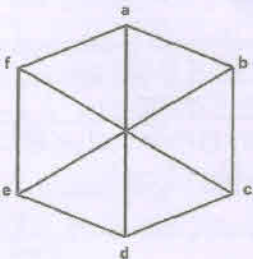
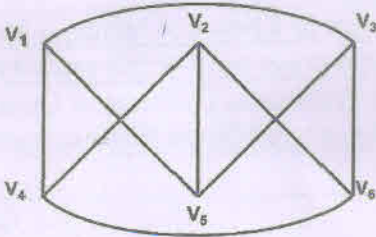
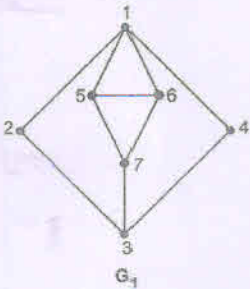
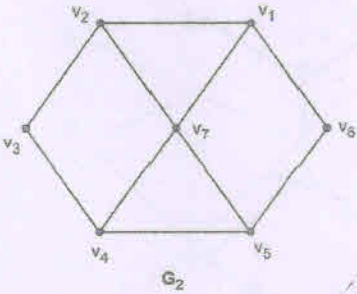
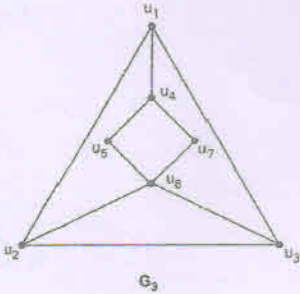
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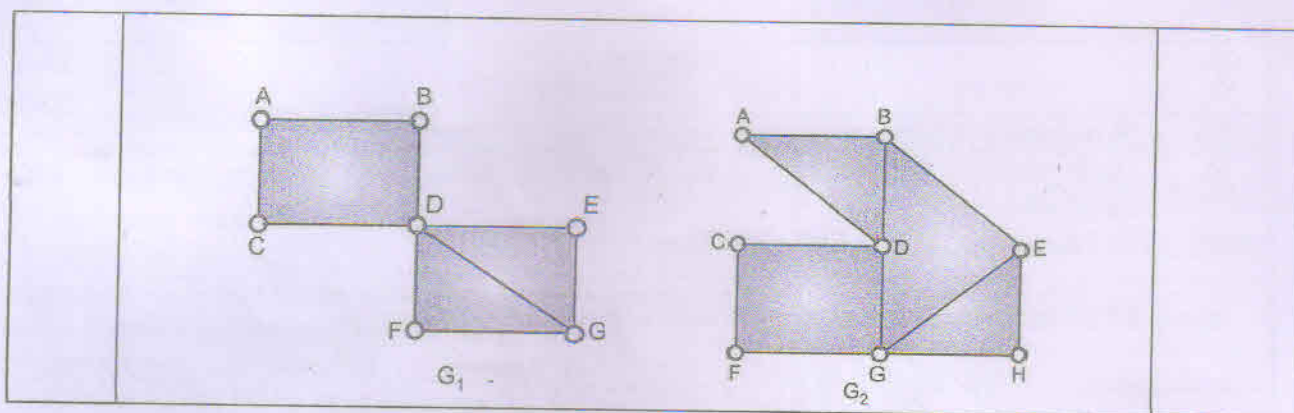
Semester: August 2022 – December 2022 – Jan/Feb 2023		
Maximum Marks: 100	Examination: ESE Examination – DSy (Reg+KT) Duration: 3 Hrs.	
Programme code: 01	Class: SY	Semester: III (SVU 2020)
Programme: B. Tech		
Name of the Constituent College: K. J. Somaiya College of Engineering		Name of the department: Computer
Course Code: 116U01C305	Name of the Course: Discrete Mathematics	
Instructions: 1) Draw neat diagrams 2) All questions are compulsory 3) Assume suitable data wherever necessary		

Que. No.	Question	Max. Marks
Q1	Solve any Four	20
i)	Explain equivalence classes with a suitable example	5
ii)	Show that if a relation on a set A is transitive and irreflexive, then it is asymmetric.	5
iii)	State Extended Pigeonhole principle and give an example to justify the statement.	5
iv)	Show that in a bounded lattice, if a complement exists, it is unique.	5
v)	State and prove right or left cancellation property for a group.	5
vi)	Define Predicates, Universe of Discourse, Quantifiers (Universal & Existential) and Negation of Quantified statement. Give an example of each.	5

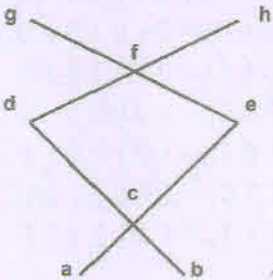
Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	Define Lattice. Determine whether the following Hasse diagram represent lattice or not. 	5
ii)	Show that if a set A has 3 elements, then we can find 8 relations on A that all have the same symmetric closure.	5
OR		
Q2 A	Find the transitive closure of R by Warshall's algorithm. Where $A = \{1, 2, 3, 4, 5, 6\}$ and $R = \{(x, y) \mid (x - y) = 2\}$.	10

Q 2 B	Solve any One	10
i)	Let $A = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ and let N be the relation on $A \times A$ defined by $(a, b) \sim (c, d)$ iff $a + d = b + c$. a. Prove that \sim is an equivalence relation. b. Find equivalence class of $(2, 5)$.	10
ii)	Let A be set of factors of positive integer m and relation is divisibility on A . i.e., $R = \{x, y\} x, y \in A, x \text{ divides } y\}$. For $m = 45$ show that Poset (A, \leq) is lattice. Draw Hasse diagram and give join and meet for the lattice.	10

Que. No.	Question	Max. Marks
Q3	Solve any Two	20
i)	<p>a. Suppose that a connected planer graph has 20 vertices, each of degree 4. Into how many regions does a representation of this planer graph split the plane?</p> <p>b. Explain which of the following graphs are planer:</p> <div style="display: flex; justify-content: space-around; align-items: center;">   </div>	10 (6+4)
ii)	<p>Explain Graph Isomorphism. Determine which of the three graphs G_1, G_2 & G_3 shown below are isomorphic. Justify your answer</p> <div style="display: flex; justify-content: space-around; align-items: center;">    </div>	10 (4+6)
iii)	<p>a. Justify following statements with the necessary graph: A. Is every Euclerian graph a Hamiltonian? B. Is every Hamiltonian graph a Euclerian?</p> <p>b. Determine which of the graphs $G1$ and $G2$ represent Eulerian circuit, Eulerian path, Hamiltonian circuit, Hamiltonian path. Justify your answer.</p>	10 (4+6)



Que. No.	Question	Max. Marks
Q4	Solve any Two	20
i)	Prove that the set $G = \{1, 2, 3, 4, 5, 6\}$ is an abelian group of order 6 with respect to \times_7 , where ' \times_7 ' is multiplication module 7.	10
ii)	<p>Let $H = \begin{bmatrix} 0 & 1 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ be a parity check matrix.</p> <p>Determine the (2,5) group code function $e_H : B^2 \rightarrow B^5$</p>	10
iii)	<p>Show that the (3,7) encoding function $e: B^3 \rightarrow B^7$ defined by</p> <p> $e(000) = 0000000$ $e(001) = 0010110$ $e(010) = 0101000$ $e(011) = 0111110$ $e(100) = 1000101$ $e(101) = 1010011$ $e(110) = 1101101$ $e(111) = 1111011$ </p> <p>is a group code.</p>	10

Que. No.	Question	Max. Marks
Q5	(Write notes / Short question type) on any four	20
i)	The converse of a statement is given. Write the Inverse and the contrapositive statements. "If I come early, then I can get the car"	5
ii)	Prove the following logical equivalence using Laws of Logic $(p \rightarrow q) \wedge [\sim q \wedge (r \vee \sim q)] \leftrightarrow \sim(q \vee p)$	5
iii)	Prove by mathematical induction that for $n \geq 1$, $1.1! + 2.2! + 3.3! + \dots + n.n! = (n+1)! - 1$	5
iv)	Let $A = B$ be the set of real numbers. $f: A \rightarrow B$ given by $f(x) = 2x^3 - 1$ $g: B \rightarrow A$ given by $g(y) = \sqrt[3]{\frac{1}{2}y + \frac{1}{2}}$ show that f is a bijective function and g is also bijective function.	5
v)	Let functions f and g be defined by $f(x) = 2x + 1$, $g(x) = x^2 - 2$, Find a. $gof(4)$ and $fog(4)$, b. $gof(a+2)$ and $fog(a+2)$, c. $fog(5)$ d. $gof(a+3)$	5
vi)	Let $A = \{a, b, c, d, e, f, g, h\}$ be the poset whose Hasse diagram is shown in Fig below.  a. Find GLB and LUB of $B = \{c, d, e\}$ b. The least upper and greatest lower bound of B	5



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Semester: August 2022 – December 2022 – Jan-2023		
Maximum Marks: 100	Examination: ESE Examination DSY (Reg+KT) Duration:3 Hrs.	
Programme code: <u>01</u>	Class:	Semester: III (SVU 2020)
Programme: <u>B. Tech</u>	S.Y.B.Tech	
Name of the Constituent College: K. J. Somaiya College of Engineering		Name of the department: Comp
Course Code: 116U01C304	Name of the Course: Object oriented programming and methodology	
Instructions: 1)Draw neat diagrams 2) All questions are compulsory 3) Assume suitable data wherever necessary		

Que. No.	Question	Max. Marks
Q1	Solve any Four	20
i)	Write the difference between procedural programming and modular programming approach.	5
ii)	What is the significance of "super" keyword in JAVA and how it is used?	5
iii)	What is the difference between an Abstract class and an Interface	5
iv)	What are the types of inheritance?	5
v)	How ArrayList is different from an array in JAVA?	5
vi)	What is coupling and cohesion?	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	For the following scenario which all relationships will come among the classes? Justify your answer. Design a system for a movie-shop, in order to handle ordering of movies and browsing of the catalogue of the store, and user subscriptions with rechargeable cards.	5 <i>Class diagram expected & relationship between them</i>
ii)	Explain aggregation and composition relationships with an example.	5
Q2 A	Draw a Class Diagram representing the following elements from the problem domain for a hockey league. A hockey league is made up of at least four hockey teams. Each hockey team is composed of six to twelve players, and one player captains the team. A team has a name and a record. Players have a number and a position. Hockey teams play games against each other. Each game has a score and a location. Teams are sometimes lead by a coach. A coach has a level of accreditation and a number of years of experience, and can coach multiple teams. Coaches and players are people, and people have names and addresses. Draw a class diagram for this information, and be sure to label all associations with appropriate multiplicities.	10
Q2 B	Solve any One	10
i)	Create a class myMath. The class contains the following static methods. i) power (x, y) – to compute x^y ii) fact (x) – to compute $x!$ Write a program to find the following series. $\cos(x) = 1 - (x^2/2!) + (x^4/4!) - (x^6/6!) + \dots$ upto n terms (n given by user).	10

	(Do not make use of inbuilt functions. Use the functions of user defined class MyMath.)	
ii)	Write a recursive static function 'gcd' to find the gcd of the given two numbers in one class. In another class use this in main method to find the gcd and LCM two given numbers.	10

Que. No.	Question	Max. Marks
Q3	Solve any Two	20
i)	Write a program which accepts information about n no of books from user. Create an array of objects to store book_id ,name,price. Your program should provide following functionalities 1.To add book 2.To delete any book detail. 3. To display book details.	10
ii)	Write a program which stores information about n students in a two dimensional array. The array should contain number of rows equal to number of students. Each row will have number of columns equal to number of semesters by that student which may vary from student to student. The program should display student number (index +1),percentage scored by that student in each semester and its average percentage as output. (It is expected to assign columns to each row dynamically after getting no of semesters value from user)•	10
iii)	Implement a menu driven program for the following: Accepts a shopping list (name, price and quantity) from the command line and stores them in a vector. 1.To delete specific item (given by user) in the vector. 2.Add item at the end of the vector. 3.Add item at specific location. 4.Print the contents of vector using enumeration interface.	10

Que. No.	Question	Max. Marks
Q4	Solve any Two	20
i)	Write a program to accept number from the user and if the number contains digit 9 then it should throw an error message "Error: Number contains digit 9".	10
ii)	interface Mat { void read(); void display(); } Create a class Matrix by implementing interface Mat. Derive class MatrixOp from Matrix and provide functions to add two matrices. Also derive class MatrixSearch from Matrix and add a function 'search ()' which searches given	10

	value in the matrix.	
iii)	What is the need of a synchronization in multithreading? Explain with the help of a program.	10

Que. No.	Question	Max. Marks
Q5	(Write notes / Short question type) on any four	20
i)	How JAVA is different from C++ explain.	5
ii)	Write a short note on any 5 methods of arraylist.	5
iii)	Explain following keyword with respect to exception handling: Try, catch, finally, throw, throws	5
iv)	Write a short note on life cycle of a thread.	5
v)	Why main function is declared as static?	5
vi)	Explain following methods of a thread class: suspend, resume and join.	5



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Semester: August 2022 – December 2022 – R Jan-2023)		
Maximum Marks: 100	Examination: ESE Examination DSY (Reg+KT) Duration: 3 Hrs.	
Programme code: 01		
Programme: Computer Engineering	Class: SY	Semester: III (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: Computer	
Course Code: 116U01C303	Name of the Course: Computer Organization and Architecture	
Instructions: 1) Draw neat diagrams 2) All questions are compulsory 3) Assume suitable data wherever necessary		

Que. No.	Question	Max. Marks
Q1	Solve any Four	20
i)	Represent 43.8765 in single and double precision floating point formats	5
ii)	Compare Vertical and Horizontal microinstructions of control unit	5
iii)	Write the microinstructions for the following instruction ADD R1, (R2)	5
iv)	Assume that there are 3 page frames which are initially empty. If the page reference string is 1,2,3,4,2,1,5,3,2,4,6,5, what will be the number of page faults using the optimal page replacement policy?	5
v)	Explain different Cache write policies	5
vi)	Give five important features of a PCI bus	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	Explain the stages of a 6 stage pipeline. Briefly explain when does a pipeline stall.	5
ii)	Explain any two pipelining hazards that need to be avoided for correct program execution	5
OR		
Q2 A	What is interrupt? Explain the interrupt cycle in an instruction cycle execution. Hence explain Interrupt driven I/O	10
Q2 B	Solve any One	10
i)	Multiply 18 with -18 using Booth's Multiplication algorithm	10
ii)	Explain the restoring division and solve using restoring division 121/5	10

Que. No.	Question	Max. Marks
Q3	Solve any Two	20
i)	Compare Paging with Segmentation	10
ii)	What is Cache Coherence problem, Explain MESI Protocol to solve cache coherence problem in uniprocessor and multiprocessor systems	10
iii)	A computer system has main memory consisting of 16GB and 4K cache organized in 4 way-set-associative manner, and 32 bytes per block. Calculate the number of bits in each of TAG, SET and WORD fields of the main memory format.	10

Que. No.	Question	Max. Marks
Q4	Solve any <u>Two</u>	20
i)	Explain instruction format and basic instruction cycle with the help of neat diagram	10
ii)	Explain microprogrammed Control unit in detail	10
iii)	Compare Bit recoding and Booth's multiplication algorithm for multiplication, Which of the two is faster. Demonstrate giving one example	10

Que. No.	Question	Max. Marks
Q5	Write short notes on any <u>four</u>	20
i)	Non restoring Division and its advantages over restoring division	5
ii)	Comparison of RISC vs CISC architectures	5
iii)	Page Replacement Algorithms	5
iv)	MIMD and SIMD with one practical example of each	5
v)	DMA data transfer modes	5
vi)	RAID Memory levels	5



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23-01-2023 (E) 2nd GP7

Semester: August 2022 – December 2022 (Jan-2023)
 Examination: ESE Examination DSY (Reg + R) Duration: 3 Hrs.
 Maximum Marks: 100
 Programme code: 01
 Programme: B. Tech Computer Engineering Class: SY Semester: III (SVU 2020)
 Name of the Constituent College: K. J. Somaiya College of Engineering Name of the department: Computer Engineering
 Course Code: 116U01C301 Name of the Course: Integral transform and Vector Calculus.
 Instructions: 1) Draw neat diagrams 2) All questions are compulsory
 3) Assume suitable data wherever necessary

Que. No.	Question	Max. Marks
Q1	Solve any Four of the following	20
i)	Find $L(e^{-3t} \sin^2 t)$.	05
ii)	Find $L^{-1}\left(\frac{s}{(s-2)^6}\right)$	05
iii)	Obtain a half – range sine series in $(0, \pi)$ for $f(x) = x(\pi - x)$.	05
iv)	Find Z-Transform of $\cos ak$ for $k \geq 0$	05
v)	Prove that $(\bar{a} \times \bar{b}) \times (\bar{a} \times \bar{c}) = [(\bar{a} \times \bar{b}) \cdot \bar{c}] \bar{a}$	05
vi)	Evaluate $\int_A^B (x^2 - y^2 + x)dx - (2xy + y)dy$ along the parabola $y^2 = x$ from $A(0, 0)$ to $B(1, 1)$.	05
Q2 A	Solve the following	10
i)	Evaluate using Laplace transform $\int_0^\infty \frac{e^{-2t} - e^{-3t}}{t} dt$.	05
ii)	Find $L^{-1}\left[\tan^{-1} \frac{a}{s}\right]$.	05
OR		
Q2 A	Find Fourier series for $f(x) = x^2$ in $(0, 2\pi)$. Hence deduce that $\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \dots$	10
Q 2 B	Solve any One of the following	10
i)	Solve $(D^2 - D - 2)y = 20 \sin 2t$, $y(0) = 1$ and $y'(0) = 2$ using Laplace transforms.	10
ii)	Find Fourier Series of $f(x) = \begin{cases} \frac{\pi}{2} + x & -\pi < x < 0 \\ \frac{\pi}{2} - x & 0 < x < \pi \end{cases}$ Hence deduce that a) $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots$ b) $\frac{\pi^4}{96} = \frac{1}{1^4} + \frac{1}{3^4} + \frac{1}{5^4} + \dots$	10

Q3	Solve any Two of the following	20
i)	(a) Find the Fourier expansion of $f(x) = \begin{cases} -c, & -a < x < 0 \\ c, & 0 < x < a \end{cases}$ in the range $(-a, a)$.	05
	(b) Find Fourier Transform of $f(x) = \begin{cases} 1 & \text{for } x < 1 \\ 0 & \text{for } x > 1 \end{cases}$	05
ii)	Show that $\vec{F} = (2xyz^2)\hat{i} + (x^2z^2 + z \cos yz)\hat{j} + (2x^2yz + y \cos yz)\hat{k}$ is conservative. Find the scalar potential Φ such that $\vec{F} = \nabla\Phi$ and hence find the work done by \vec{F} in displacing a particle from $A(0, 0, 1)$ to $B(1, \pi/4, 2)$ along the straight line AB .	10
iii)	Verify Green's Theorem in the plane for $\oint_C [(xy + y^2)dx + x^2dy]$ Where C is the closed curve of the region bounded by $y = x$ and $y^2 = x$.	10
Q4	Solve any Two of the following	20
i)	(a) Find $Z[\frac{1}{K}]$	05
	(b) Prove that $\nabla \cdot \left[\frac{\log r}{r} \vec{r} \right] = \frac{1}{r} [1 + 2 \log r]$	05
ii)	Prove that $\vec{F} = (x + 2y + az)\hat{i} + (bx - 3y - z)\hat{j} + (4x + cy + 2z)\hat{k}$ is solenoidal and determine the constants a, b, c if \vec{F} is irrotational.	10
iii)	Using Stokes theorem evaluate $\int_C \vec{F} \cdot d\vec{r}$ where $\vec{F} = 2y(1 - x)\hat{i} + (x - x^2 - y^2)\hat{j} + (x^2 + y^2 + z^2)\hat{k}$ and C is the boundary of the plane $x + y + z = 2$ Cut off by the coordinate planes.	10
Q5	Solve any Four of the following	20
i)	Evaluate $\int_0^\infty e^{-t} [1 + 2t - t^2 + t^3] H(t - 1) dt$ using Laplace transform.	05
ii)	Find $L^{-1} \left(\frac{s^2}{(s^2 + 1)^2} \right)$ using convolution theorem.	05
iii)	Obtain the complex form of Fourier Series for $f(x) = e^{ax}$ in $(0, a)$.	05
iv)	Find $Z^{-1} \left[\frac{1}{(z-3)(z-2)} \right]$ for $ z > 3$	05
v)	Find the angle between the surfaces $x \log z + 1 - y^2 = 0$ and $x^2y + z = 2$ at $(1, 1, 1)$.	05
vi)	Find the directional derivative of $\phi = xy + yz + xz$ at $(1, 2, 1)$ along the normal to the surface $x^2 + y^2 = z + 4$ at $(1, 1, -2)$	05



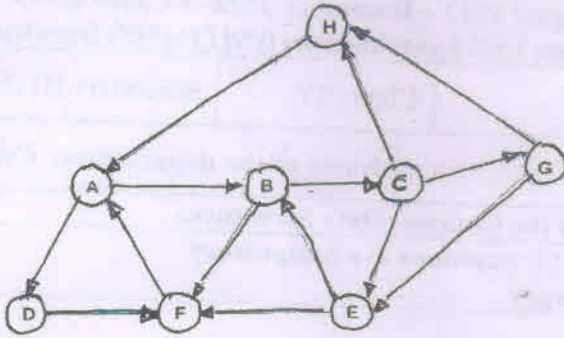
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Semester: August 2022 – December 2022 – (Jan-2023)		
Examination: ESE Examination- DSY (Reg+KT) Duration: 3 Hrs.		
Maximum Marks: 100	Class: SY	Semester: III (SVU 2020)
Programme code: 01		
Programme: B Tech		
Name of the Constituent College:	Name of the department: Computer / IT	
K. J. Somaiya College of Engineering		
Course Code: 116U04C302	Name of the Course: Data Structures	
Instructions: 1) Draw neat diagrams 2) All questions are compulsory		
3) Assume suitable data wherever necessary		

Que. No.	Question	Max. Marks
		20
Q1	Solve any Four	5
i)	What is ADT? Explain with an example	5
ii)	Why dynamic storage allocation is required? Explain.	5
iii)	How Queue data structure is useful in simulation?	5
iv)	What are threaded binary tree applications?	5
v)	Explain partition and union-operations in set.	5
vi)	What is hashed list search?	

Que. No.	Question	Max. Marks
		10
Q2 A	Solve the following	5
i)	Explain linked list implementation of polynomial addition.	5
ii)	Show the steps of infix to postfix conversion for following expression. $A*(B*C+D/E)+F$	
	OR	
Q2 A	Define a priority queue data structure as an ADT. List the operations on a priority queue. Write algorithm for addition and deletion of an element in a priority queue implemented with singly linked list.	10
Q2 B	Solve any One	10
i)	How stack data structure is useful in recursion? Write an algorithm to reverse a stack using recursion. Demonstrate with an example.	10
ii)	For circular singly linked list, design an approach a) for inserting an element at the beginning b) for deleting an element at the end c) searching an element	10

Que. No.	Question	Max. Marks
		20
Q3	Solve any Two	10
i)	Construct AVL Tree for the following sequence of numbers with explanation of each step. 50, 38, 46, 10, 8, 25, 32, 64, 11, 44.	
ii)	Explain the delete a node operation in BST, for all three cases with appropriate example.	10

iii)	<p>Show all the steps of DFS algorithm on the following graph by starting at the vertex 'H'.</p>  <p>If the graph is undirected what are the changes done in DFS algorithm?</p>	10
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Que. No.	Question	Max. Marks
Q4	Solve any Two	20
i)	<p>Suppose you have the following list of numbers to sort: 19, 1, 9, 7, 3, 10, 13, 15, 8, 12.</p> <p>After three complete passes we get;</p> <p>Case 1: We get the output of [1, 3, 7, 9, 10, 8, 12, 13, 15, 19] Case 2: We get the output of [1, 9, 19, 7, 3, 10, 13, 15, 8, 12]</p> <p>Identify the sorting algorithm used in Case 1 and Case 2 with justification of answer.</p>	10
ii)	Compare linear search and binary search on the basis of given points; definition, sorted data, approach, size of array, efficiency	10
iii)	Discuss various ways in which a graph data structure can be represented by giving example of each technique.	10

Que. No.	Question	Max. Marks
Q5	Write notes on any four	20
i)	Type of Data structures	5
ii)	Doubly linked list representation	5
iii)	Postorder traversal of a binary tree	5
iv)	Data Structure used in BFS traversal of graph	5
v)	Dictionary ADT and its applications	5
vi)	Counting Sort	5