19·12·2022 (E)

SOMAIYA VIDYAVIHAR UNIVERSITY

Semester: August 2022 – December 2022		
Maximum Marks: 100 **Examination: ESE Examination**		**Duration:3 Hrs.**
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 $L\left[\frac{1}{t}(e^{-at}-e^{-bt})\right]$.	05
ii)	Find $L^{-1}\left\{\frac{4s+12}{s^2+8s+12}\right\}$.	05
iii)	Obtain half – range Fourier cosine series for $f(x)=x$ in $0<x<2$.	05
iv)	Find Z-Transform of $\sin \alpha k$ for $k \geq 0$	05
v)	If $\bar{a}=i+2j-k,\ \bar{b}=2i+j+3k, \bar{c}=i-j+k,$ $\bar{d}=3i+j+2k$, find $(\bar{a}\times\bar{b})\times(\bar{c}\times\bar{d})$	05
vi)	Evaluate $\int_A^B y^2dx+xydy$ along $x=t^2, y=2t$ from $A(1,-2)$ to $B(0,0)$.	05
Q2 A	Solve the following	**10**
i)	Evaluate $\int_0^\infty \frac{\sin^2 2t}{t}dt$.	05
ii)	Find $L^{-1}[\cot^{-1}(as)]$.	05
	OR	
Q2 A	Find the Fourier Series of the function $f(x)=e^{-x}, 0<x<2\pi$. Hence deduce the value of $\sum_{n=2}^{\infty}\frac{(-1)^n}{n^2+1}$	10
Q 2 B	Solve any **One** of the following	**10**
i)	Solve $(D^2-4)y=3e^t, y(0)=0, y'(0)=3$ using Laplace transforms.	10
ii)	If $f(x)=\begin{cases}x+\frac{\pi}{2}, & -\pi\leq x\leq 0\\ \frac{\pi}{2}-x, & 0\leq x\leq \pi\end{cases}$ Then Find the Fourier Series of $f(x)$ in $(-\pi, \pi)$ Hence deduce that $\frac{\pi^4}{96}=\frac{1}{1^4}+\frac{1}{3^4}+\frac{1}{5^4}+\cdots$.	10

Q3	Solve any **Two** of the following	**20**
i)	(a) Find the Fourier coefficient a_n in Fourier expansion of $f(x) = \begin{cases} 0, & -2 < x < -1 \\ 1+x, & -1 < x < 0 \\ 1-x, & 0 < x < 1 \\ 0, & 1 < x < 2 \end{cases}$ in the range $(-2, 2)$.	05
	(b) Find Fourier Sine Transform of $e^{-\lvert x \rvert}$	05
ii)	If the vector function $\bar{F} = (x + 2y + az)\hat{\imath} + (bx - 3y - z)\hat{\jmath} + (4x + cy + 2z)\hat{k}$ is irrotational find constants a, b, c. Find scalar potential function $\emptyset$ such that $\bar{F} = \nabla\emptyset$. Also find the work done of the moving partical in the same field from $(1, 2, -4)$ to $(3, 3, 2)$ along the straight line joining these points.	10
iii)	Verify Green's Theorem for $\oint_c \left(\frac{1}{y}dx + \frac{1}{x}\,dy\right)$ where c is the boundary of the region defined by $x = 1, x = 4, y = 1, \& y = \sqrt{x}$.	10
Q4	Solve any **Two** of the following	**20**
i)	(a) Find $Z^{-1}[\frac{1}{(z-3)(z-2)}]$ for $2 < \lvert z \rvert < 3$	05
	(b) Evaluate $\int_c \bar{F} \cdot d\bar{r}$, where $\bar{F} = \cos y\,\hat{\imath} - x \sin y\,\hat{\jmath}$ and c is the curve $y = \sqrt{1 - x^2}$ in the xy plane from (1,0) to (0,1).	05
ii)	Find $\phi(r)$ such that $\nabla\phi = -\frac{\bar{r}}{r^5}$ and $\phi(2) = 3$	10
iii)	Evaluate by Gauss's Divergence theorem $\iint_s \bar{N}.\bar{F}\,ds$ Where $\bar{F} = 4x\hat{\imath} - 2y^2\hat{\jmath} + z^2\hat{k}$ & S is the region bounded by $x^2 + y^2 = 4$, $z = 0, z = 3$.	10
Q5	Solve any **Four** of the following	**20**
i)	Find Laplace transform of $(1 + 2t - 3t^2 + 4t^3)H(t - 2)$.	05
ii)	Using convolution theorem find inverse laplace transform of $\frac{1}{(s^2+1)(s^2+9)}$	05
iii)	Obtain the complex form of Fourier Series for $f(x) = \cosh 3x + \sinh 3x$ in $(-3, 3)$.	05
iv)	Using convolution theorem find $Z^{-1}[\frac{8z^2}{(2z-1)(4z-1)}]$	05
v)	Find the unit normal to the surface $xy^3z^2 = 4$ at$(-1, -1, 2)$.	05
vi)	In what direction from the point $(2, 1, -1)$ is the directional derivative of $\Phi = x^2yz^3$ Maximum? What is its magnitude?	05

21·12·2022 (E)

SOMAIYA VIDYAVIHAR UNIVERSITY

Semester: August 2022 – December 2022		
Maximum Marks: 100 **Examination: ESE Examination**		**Duration:3 Hrs.**
Programme code: 04/02 **Programme:** B TECH	**Class:** SY	**Semester: III(SVU 2020)**
Name of the Constituent College: **K. J. Somaiya College of Engineering**	**Name of the department: Information Technology / Computer Engg**	
Course Code: 116U01C302	**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
Q1	Solve any **Four**	**20**
i)	Define abstract data type. Give example of abstract data type. What is the difference between in built data type and abstract data type?	5
ii)	What are the advantages and disadvantages of circular linked list?	5
iii)	Write applications of priority queue.	5
iv)	Differentiate between B tree and B+ tree.	5
v)	Explain counting sort. Also state the reason why counting sort is called stable sort?	5
vi)	Convert infix expression A*B - C/D + E into prefix.	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	**10**
i)	What is static memory allocation? Give example of memory allocation. What are the advantages of memory allocation?	5
ii)	What is dynamic memory allocation? Give example of dynamic memory allocation. What are the advantages of dynamic memory allocation?	5
	OR	
Q2 A	What is data structure? How data structure varies from data type? Explain the classification of data structures? What are different types of data structure?	10
Q 2 B	Solve any **One**	**10**
i)	What is Hashing? Explain the different types of hashing. Which hashing method is better? Justify.	10
ii)	Explain SET as ADT with all operations. Also write application for the same.	10

Que. No.	Question	Max. Marks
Q3	Solve any **Two**	**20**
i)	What is doubly linked list? Explain working of doubly linked list. Give two real time application of doubly linked list.	10
ii)	Define Stack. Write pseudo code using array or linked list: a. Write a function to check a stack is an underflow b. Write a function to delete an element from stack c. Write a function to display the stack elements	10
iii)	What is Dequeue? Write the pseudo code for insertion at front end and insertion at rear end.	10

Que. No.	Question	Max. Marks
Q4	Solve any **Two**	**20**
i)	Explain the bubble Sort in detail with the help of algorithm. Also sort following numbers 10, 9,11,6,15,2,4,13 using bubble sort by illustrating each step.	10
ii)	Explain the insertion Sort in detail with the pseudo code. Also sort following numbers 23, 34, 2, 43, 15, 25, 65, 51, 44, 8, 21 using insertion sort by illustrating each step.	10
iii)	Explain linear search and binary search with example. Show all the steps.	10

Que. No.	Question	Max. Marks
Q5	Write any **four**	**20**
i)	For web page navigation in forward and backward which data structure will be useful? Justify your answer.	5
ii)	Explain the types of binary tree.	5
iii)	Differentiate between DFS and BFS.	5
iv)	Define MAP ADT and its application.	5
v)	State which data structure is used for BFS traversal and show BFS traversal with an small example	5
vi)	Why linked list is better than array? List different types of linked list?	5

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SOMAIYA VIDYAVIHAR UNIVERSITY

Semester: August 2022 – December 2022		
Maximum Marks: 100 **Examination: ESE Examination**		**Duration:3 Hrs.**
Programme code: 01 **Programme: Btech Computer Engineering**	**Class:** **SYBTECH**	**Semester: III(SVU 2020)**
Name of the Constituent College: **K. J. Somaiya College of Engineering**	**Name of the department: Computer**	
CourseCode: 116U01C303	**Name of the Course: Computer Organisation 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)	Explain the function of each functional unit in computer system	5
ii)	List features of PCI bus structure	5
iii)	What is micro programmed control unit ?	5
iv)	What is use of input output module ?	5
v)	Explain the application of microprogramming	5
vi)	List the different replacement algorithms in cache	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	**10**
i)	Explain SCSI bus standards	5
ii)	Explain restoring division algorithm and divide 8/3	5
	OR	
Q2 A	Explain different addressing modes of 8086	10
Q 2 B	Solve any **One**	**10**
i)	Draw and explain different RAID levels	10
ii)	What is DMA? Also explain the different modes of data transfer of DMA	10

Que. No.	Question	Max. Marks
Q3	Solve any **Two**	**20**
i)	Write note on Programmed Input output technique.	10
ii)	Write note on Flynn's classification	10
iii)	Compare paging and segmentation	10

Que. No.	Question	Max. Marks
Q4	Solve any **Two**	**20**
i)	What is virtual memory? Discuss how virtual address is converted to physical address	10
ii)	Explain six stage instruction pipeline and which unit take care of each stage	10
iii)	Explain floating point representation IEEE standard format	10

Que. No.	Question	Max. Marks
Q5	(Write notes / Short question type) on any **four**	**20**
i)	Explain the function of SCSI bus	5
ii)	What is an interrupt?	5
iii)	Compare RISC and CISC	5
iv)	Explain the set associative cache	5
v)	When is the Booth's algorithm less efficient ?	5
vi)	Discuss the pipeline hazards	5

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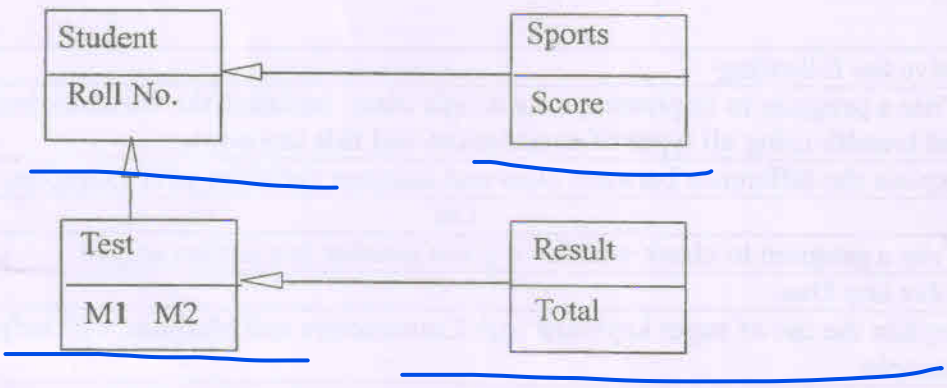
SOMAIYA VIDYAVIHAR UNIVERSITY

Semester: August 2022 – December 2022		
Maximum Marks: 100 **Examination: ESE Examination**		**Duration:3 Hrs.**
Programme code: 01 **Programme:** B.Tech	**Class:** SY	**Semester:** III **(SVU 2020)**
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 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)	Explain the features of Object Oriented Programming.	5
ii)	Explain the difference between class and object.	5
iii)	Explain how String class differs from StringBuffer and StringBuilder classes.	5
iv)	Explain how multiple inheritance can be implemented in Java.	5
v)	Explain Association relationship between classes with the help of an example.	5
vi)	Explain the various levels of access protection available for packages.	5
Q2 A	Solve the following	**10**
i)	Write a program to implement a Rectangle class. Initialize the variables length and breadth using all types of constructors and **this** keyword.	5
ii)	Explain the difference between class and instance variables with examples.	5
	OR	
Q2 A	Write a program to check whether a given number is a perfect square.	10
Q2 B	Solve any **One**	**10**
i)	Explain the use of super keyword with Constructors and Methods with help of example.	10
ii)	Create a Java Class "Shape" with a constructor to initialize a variable "dimension". Create three subclasses of Shape with the following methods: 1. "Circle" with methods to calculate the area and circumference of the circle with dimension as radius. 2. "Square" with methods to calculate the area and length of diagonal of the square with dimension as length of one side. 3. "Sphere" with methods to calculate the volume and surface area of the sphere with dimension as radius of the sphere. 4. Write an appropriate main method to create objects of each class and test every method.	10
Q3	Solve any **Two**	**20**
i)	Explain the lifecycle of a thread.	10
ii)	Create a user defined exception subclass called wrongDateException that is thrown when the date entered by the user is not within permissible range. The permissible range is defined as dd 1 to 31, mm 1 to 12 and yy >=2000 and	10

	<=2022. Write the necessary constructors and override tostring method to display an appropriate message for the exception.	
iii)	Write an interface called "Calculator" that has: 1. Methods for finding the sum, difference, product and remainder of two integer values 2. Write a class that implements this interface	10
Q4	Solve any **Two**	**20**
i)	Distinguish between Abstract Class and Interface.	10
ii)	Create an abstract class with: 1. A constructor which prints "This is constructor of abstract class" 2. An abstract method named a_method 3. A non-abstract method which prints "This is a normal method of abstract class" 4. Class "SubClass" inherits the abstract class and has a method a_method which prints "This is an abstract method" 5. Create an object of SubClass and call the abstract and non-abstract methods	10
iii)	An education institution wishes to maintain a database of its students. The database is divided into a number of classes, whose relationships are shown below. The figure also shows the minimum information required for each class. Specify all the classes and define methods to create the database and retrieve individual information as and when required. 	10
Q5	Write short notes on any **four**	**20**
i)	Static and Dynamic Binding	5
ii)	Static and non-static methods	5
iii)	Collection Framework in Java	5
iv)	Types of inheritance	5
v)	Aggregation and Composition relationships in Class Diagrams	5
vi)	Exception handling mechanism	5

28.12.2022(E)

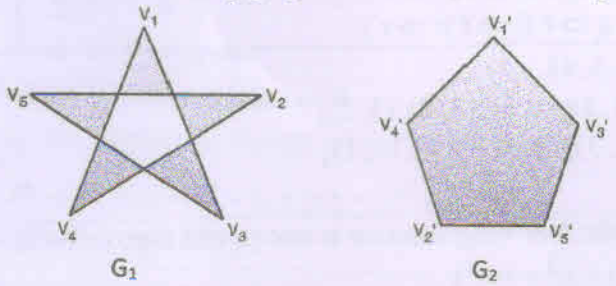
SOMAIYA VIDYAVIHAR UNIVERSITY

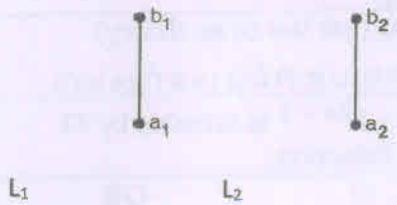
Semester: August 2022 – December 2022		
Maximum Marks: 100 **Examination: ESE Examination**		**Duration:3 Hrs.**
Programme code:01 **Programme: B.Tech. Computer Engineering**	**Class: SY**	**Semester: III(SVU 2020)**
Name of the Constituent College: **K. J. Somaiya College of Engineering**	**Name of the department: COMP**	
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)	Determine number of positive integers n where $1 \leq n \leq 100$ and n is not divisible by 2, 3 or 5.	5
ii)	Prove by laws of logic (do not use truth table) that the following statement is a tautology. $((p \Rightarrow q) \wedge (q \Rightarrow r)) \Rightarrow (p \Rightarrow r)$	5
iii)	Let A = {1, 2, 3, 4}, R = {(1, 2), (1, 1), (1, 3), (2, 4), (3, 2)} S = {(1, 4), (1, 3), (2, 3), (3, 1), (4, 1)} Find S o R.	5
iv)	Test whether the following function is one-to-one onto or both. $f: Z \rightarrow Z, f(x) = x^2 + x + 1$	5
v)	How many edges must a planar graph have if it has 7 regions and 5 nodes? Draw one such graph.	5
vi)	Let (A, *) be an algebraic system where * is a binary operation. Such that for any a and b in A. a * b = a. (i) Show that * is an associative operation. (ii) Can * ever be a commutative operation.	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	**10**
i)	Prove the following (use law of set theory) $(A \cap B) \cup [B \cap ((C \cap D) \cup (C \cap \bar{D}))] = B \cap (A \cup C)$	5
ii)	Prove that $6^{n+2} + 7^{2n+1}$ is divisible by 43. Use mathematical induction.	5
	OR	
Q2 A	Let A = {1, 2, 3, 4} and R = {(1, 2), (2, 3), (3, 4), (2, 1)}. Find transitive closure of R using Warshall's algorithm.	10
Q 2 B	Solve any **One**	**10**
i)	For the set X = {2, 3, 6, 12, 24, 36}, a relation ≤ is defined as $x \leq y$ if x divides y. Draw the Hasse diagram for (X, ≤). Answer the following. (i) What are the maximal and minimal elements ? (ii) Give one example of chain and antichain.	10

	(iii) Is the poset a lattice ?	
ii)	Let S = {1,2,3,4,5} and A= S × S. Define the following relation R on A : (a,b) R (c,d) if and only if ad = bc. Show that R is an equivalence relation.	10

Que. No.	Question	Max. Marks
Q3	Solve any **Two**	**20**
i)	The college catering service must decide if the mix of food that is supplied for receptions is appropriate. of 100 people questioned, 37 say they eat fruits, 33 say they eat vegetables, 9 say they eat cheese and fruits, 12 eat cheese and vegetables, 10 eat fruits and vegetables, 12 eat only cheese, and 3 report they eat all three offerings. How many people surveyed eat cheese? How many do not eat any of the offerings?	10
ii)	Determine if following graphs G_1 and G_2 are isomorphic or not.  	10
iii)	State pigeon hole principle and extended pigeon hole principle. What is the minimum number of students required in a discrete structures class to be sure that at least six will receive the same grade, if there are five possible grades A, B, C, D, E.	10

Que. No.	Question	Max. Marks
Q4	Solve any **Two**	**20**
i)	If L_1 and L_2 are the lattices shown in following figure. Draw the Hasse diagram of $L_1 \times L_2$ with the product partial order.  	10
ii)	Define Euler path, Euler circuit, Hamiltonian Path and Hamiltonian Circuit. Determine Hamiltonian Cycle and path in graph shown in fig. (a)	10

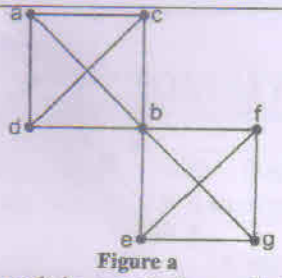


Figure a

Determine Euler Cycle and path in graph shown below fig. (b)

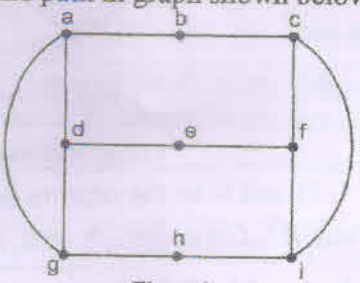


Figure b

iii) Consider the set A= {1, 2, 3, 4, 5, 6} under the multiplication modulo 7. 10

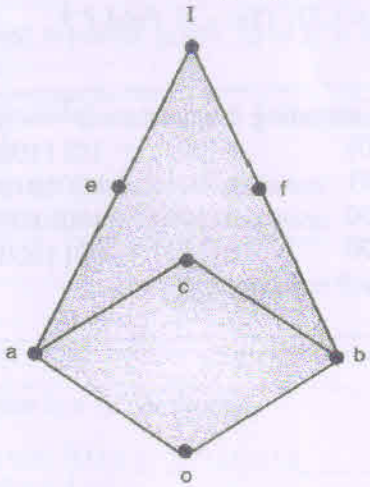
(a)Find the multiplication table for the above

(b)Find the inverses of 2, 3 and 5, 6

(c)Prove that it is a cyclic group

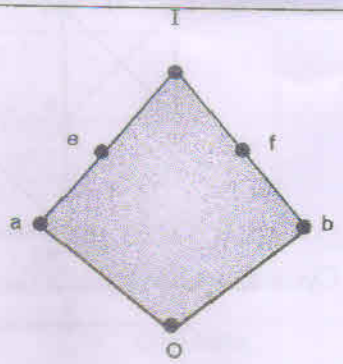
(d)Find the orders and the subgroups generated by {3, 4} and {2, 3}

Que. No.	Question	Max. Marks
Q5	Solve any **four**	**20**
i)	Consider the lattice shown in the following figure	5



Determine whether or not each of the following is a sublattice of L.

Fig. a

	 Fig. b	
ii)	Let A = {1, 2, 3, 4, 5} and R be the relation defined by a R b if and only if a < b compute R, R^2 and R^3. Draw digraph of R, R^2 and R^3.	5
iii)	Let A = {a, b, c, d, e} and let R be the relation whose matrix is $M_R = \begin{bmatrix} 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 1 \end{bmatrix}$ (i) Find the reflexive closure of R (ii) Find the symmetric closure of R.	5
iv)	Let $f : R \to R$, $f(x) = x^2 - 1$, $g(x) = 4x^2 + 2$ find (i) f o (g o f) (ii) g o (f o g).	5
v)	Function $f(x) = (4x + 3) / (5x - 2)$. Find f^{-1}.	5
vi)	Consider the (3, 8) encoding function $e : B^3 \to B^8$ defined by e (000) = 00000000 e (001) = 10111000 e (010) = 00101101 e (011) = 10010101 e (100) = 10100100 e (101) = 10001001 e (110) = 00011100 e (111) = 00110001 How many errors will e detect and correct?	5