SE sem IIIrd AI&DS R-19 Cscheme QPcode: 10081925

Time :(3 hours) **Total Marks: 80**

N.B. 1. Question **No. 1** is compulsory
2. Attempt **any three** questions from remaining five questions
3. Assume suitable data if **necessary** and justify the assumptions
4. Figures to **the right** indicate full marks

Q1	A	Explain the Register organization of processor	**05**
	B	Describe the Full Adder circuit with a neat diagram and truth table	**05**
	C	Explain the IEEE 754 standards for representation of floating point numbers	**05**
	D	Draw the detailed Von-Neumann Architecture and explain in brief	**05**
Q2	A	Draw the flow chart of Non Restoring division algorithm and Perform 6 ÷2	**10**
	B	Explain the instruction cycle with the help of a neat state diagram	**10**
Q3	A	Draw the Flowchart for the Booth's Algorithm for signed integer multiplication and perform the multiplication between 6 and 2 using this Algorithm	**10**
	B	Explain the various methods of designing a hardwired control unit	**10**
Q4	A	Consider a fully associative mapped cache with block size 4 KB. The size of main memory is 16 GB. Find the number of bits in tag.	**10**
	B	Explain Flynn's classification	**10**
Q5	A	What is the difference between Computer organization and Computer architecture explain it with a example	**05**
	B	Differentiate between Interleaved and Associative Memory	**05**
	C	Explain Instruction pipelining and the hazards associated with it .	**10**
Q6		Write short notes on	**20**
	A	.Logic Gates	
	B	Flip Flops	
	C	Cache Coherence	
	D	PCI Bus	

SE| sem III / R-19 C-Scheme | AIDS

Paper / Subject Code: 49312 / Discrete Structures & Graph Theory

Time: Marks: 80

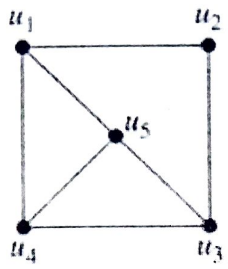
N.B. : (1) Question Number 1 is compulsory2)Solve any three questions from the remaining questions

3) Make suitable assumptions if needed

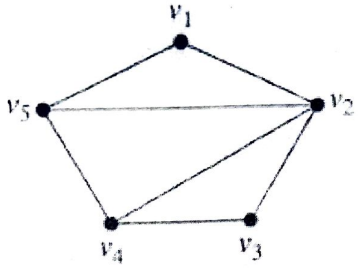
4) Assume appropriate data whenever required. State all assumptions clearly.

1.	a.	Explain the following terms partition set with suitable example. 1. Partition set 2. Disjoint sets	5
	b.	Construct the Truth Table and check if the following statement is tautology. **$(P \rightarrow Q) \leftrightarrow (\neg Q \rightarrow \neg P)$**	5
	c.	Let f : A→B be a Function from A to B . Prove that f^{-1} exists if and only if f is a Bijective Function.	5
	d.	Prove by mathematical induction that **$x^n - y^n$ is divisible by x-y**	5
2	a	Define Equivalence Relation. A relation R is called circular if aRb and bRc imply cRa. Show that R is circular if and only if it is an Equivalence Relation	8
	b.	Let A = {1,2,3,4} and R= {(1,1), (1.2), (1,4), (2,4), (3.1), (3,2), (4,2), (4,3), (4,4)}. Find Transitive Closure of R using Warshall's algorithm.	8
	c	Let f: R → R be a function defined by f(x)=2x-3. Prove that it is Bijective & find inverse.	4
3	a	Let f,g,h be functions on real numbers R defined as follows: $f(x) = 2x+5$, $g(x) = 5x + 3$, $h(x) = 3x$ Find: 1) fog 2) g o f 3) g o h 4) f o g o h 5) g o f o h	8
	b	Give the generating function for the following sequences 1) {0,1,2,3,4...} 2){1,2,3,4,5 ...} 3) {2,2,2,2,2...} 4) { 0,0,0,1,1,1,1,...}	8

c Determine whether the following graphs are isomorphic. Justify your answer. 4



G1



G2

4 a A Function $f: R - \{(7/3)\} \rightarrow R - \{4/3\}$ is defined as $f(x) = (4x - 5)/(3x - 7)$ 8

Prove that f is Bijective and find the rule for f^{-1}

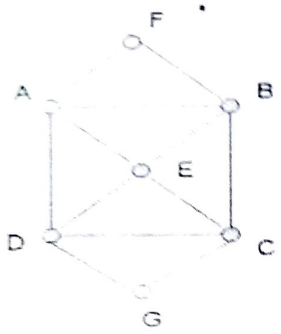
b Show that the (2, 5) encoding function $e: B^2 \rightarrow B^5$ defined by 8

$e(00) = 00000$ $e(01) = 01110$

$e(10) = 10101$ $e(11) = 11011$ is a group code.

c How many numbers must be selected from the set {1,2,3,4} to guarantee that at least one pair of these will add up to 7. 4

5 a Define Euler Path, Euler Circuit, Hamiltonian Path and Hamiltonian Circuit. Determine if the following diagram has Euler Path, Euler Circuit, Hamiltonian Path and Hamiltonian Circuit and state the path /circuit. 8



b Prove that the set of Real numbers under * defined by **a*b=a+b-2** is a group 8

c Find the complement of each element in D_{42} 4

6. a Draw the Hasse Diagram of D_{60} and check whether it is a Lattice. 8

b Solve the recurrence relation $a_{n+2} - 5a_{n+1} + 6a_n = 2$ 8

with initial conditions $a_0=1$, $a_1 = -1$

c Define the following with suitable example. 4
a)Equivalence Class b) Sub group c) Distributive Lattice d) Injective Function

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QP code : 10081973

SE Sem-III AIDS R-19 C Scheme

TIME: 03 HOURS **MAX. MARKS : 80**

Note:

1. Question **No. 1** is compulsory.
2. Attempt **any three** questions out of remaining **five** questions.
3. Assume suitable data wherever necessary.
4. Figures to right indicate full marks.

Marks

Q.1 Answer the following **(Any four)**

a. Find the Laplace transform of $t\,sin^3 t$. **05**

b. Calculate the Spearman's rank correlation coefficient R. **05**

X	10	12	18	18	15	40
Y	12	18	25	25	50	25

c. Find the constants a, b, c, d ,e if f (z) = $(a\,x^3 + bx\,y^2 + 3x^2 + cy^2 + x) + i\,(dx^2y - 2y^3 + e\,x\,y + y)$ is analytic. **05**

d. Find inverse Laplace transform of $tan^{-1}\left(\frac{s+a}{b}\right)$. **05**

Q.2 a. Evaluate by using Laplace transform of $\int_0^\infty \left(\frac{\sin 3t + sn\ 2t}{te^t}\right)$ dt. **06**

b. If the mean of the following distribution is 16 find m, n and variance **06**

X :	8	12	16	20	24
P (X= x) :	$\frac{1}{8}$	m	n	$\frac{1}{4}$	$\frac{1}{12}$

c. Obtain the Fourier expansion of $f(x) = \left(\frac{\pi - x}{2}\right)^2$ in $(0, 2\pi)$ **08**

Hence show that $\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2}$ ....

Q.3 a. Find the analytic function f (z) = u + i v in terms of z if $u + v = e^x(\cos y + \sin y) + \frac{x-y}{x^2+y^2}$. **06**

b. Find the coefficient of regression and hence the equations of the lines of regression for the following data **06**

X	78	36	98	25	75	82	90	62	65	39
Y	84	51	91	60	68	62	86	58	53	47

c. Using convolution theorem Find the inverse Laplace transform of $\frac{1}{(s^2+4s+13)^2}$ **08**

Q.4 a. Obtain Fourier series of $f(x) = |\sin x|$ in $((-\pi, \pi)$. 06

b. If X denotes the outcome when a fair die is tossed, find the moment generating function of x and hence find the mean and variance of X. 06

c. Evaluate by using Laplace transforms of $\int_0^{\infty} e^{-t}\,(t \int_0^t e^{-4u} \cos u\, du)dt$ 08

Q.5 a. Find the orthogonal trajectories of family of curves $3x^2y + 2x^2 - y^3 - 2y^2 = c$. 06

b. Find the inverse Laplace transform of $\frac{s+29}{(s+4)(s^2+9)}$. 06

c. Fit a second-degree parabolic curve to the following data and estimate the Production in 1982. 08

Year (X)	1974	1975	1976	1977	1978	1979	1980	1981
Production (y)(in tons)	12	14	26	42	40	50	52	53

Q.6 a. Obtain half range Sine series for $f(x) = x - x^2$ in $0 \le x \le 1$. 06

Hence show that $\frac{\pi^3}{32} = \frac{1}{1^3} - \frac{1}{3^3} + \frac{1}{5^3} - \frac{1}{7^3} \ldots\ldots$

b. Show that the function $v = e^{2x}(y \cos 2y + x \sin 2y$ *is* harmonic. 06
And find its corresponding analytic function $f(z) = u + iv$.

c. Find the value of k if the function $f(x) = k\,x^2(1 - x^3)$, $0 \le x \le 1$ 08
$f(x) = 0$ otherwise
Is a probability density function. Also find $p\,(0 \le x \le \frac{1}{2})$ find mean and variance.

QPcode: 10082557

SE Sem III rd AI&DS R-19 C Scheme

(3 Hours) **Total Marks: 80**

N.B: (1) Question No. 1 is compulsory
(2) Attempt any three questions out of the remaining five questions
(3) Figures to the right indicate full marks
(4) Make suitable assumptions wherever necessary with proper justifications

Q1	A	Differentiate between arrays and linked lists.	[05]
	B	Define data structure and Explain types of data structures.	[05]
	C	Write a program in C to reverse a string using stack.	[05]
	D	Explain the concept of a queue ADT and describe a real-world application where queues are useful.	[05]
Q2	A	Write a program to perform following operations on the Doubly linked list a) Create the list b) Insert element at the beginning c) Insert element at the end d) Delete last element of the list	[10]
	B	Explain the process of deleting a node from a Binary Search Tree(BST). Illustrate the cases of deletion with examples.	[10]
Q3	A	Write a program in C to convert a given infix expression into a postfix expression.	[10]
	B	Explain the concept of Huffman coding and describe the steps for constructing a Huffman tree. Given the following characters with frequencies, construct the Huffman tree and generate the Huffman codes: A:5, B:9, C:12, D:13, E:16	[10]
Q4	A	Construct an AVL tree by inserting the following elements in sequence, showing the tree after each insertion and rotation: 30, 20, 10, 25, 40, 50, 5, 6, 11, 12.	[10]
	B	Write a program in C to implement stack ADT using an array.	[10]
Q5	A	Explain the key differences between a singly linked list, a doubly linked list, and a circular linked list. Use diagrams to show the structure of each type and discuss the advantages and disadvantages of each.	[10]
	B	Write a program in C to implement circular queue using linked list.	[10]
Q6	A	Explain Depth First search and Breadth First search graph traversal techniques with example.	[10]
	B	A hash table has 10 slots, and the following keys are inserted in this order: 21, 33, 40, 98, 51, 64, 10, 75, 4, 86. Using linear probing as the collision resolution technique, show the final arrangement of keys in the hash table. Use the hash function h(x) = x % 10.	[10]