Paper / Subject Code: 50921 / Engineering Mathematics-III

S.E. | Sem - III | Comp. | June - 2024
04/06/2024

Marks: 80

Time: 3 hours

N.B.   (1) Question No. 1 is compulsory.

(2) Answer any three questions from Q.2 to Q.6.

(3) Use of Statistical Tables permitted.

(4) Figures to the right indicate full marks

Q1   A   If $f(t) = (\sqrt{t} + \frac{1}{\sqrt{t}})^2$, find L[f(t)] and hence find $L\{e^{2t}f(t)\}$ 5

B   Find $L^{-1}\{\frac{1}{s(s^2+4)}\}$ 5

C   Obtain half-range cosine series for f(x) = x(2-x) in 0<x<2   5

D   Find moment generating function of the following distribution. Hence find mean and variance.   5

X	1	3	4	5
P(X)	0.4	0.1	0.2	0.3

Q2   A   Find the orthogonal trajectories of the family of curves $e^{-x}[\,xsiny - ycosy] = c$ 6

B   Find $L\{t(\frac{cost}{e^t})^2\}$ 6

C   Find the Fourier series expansion for f(x) = 2,   -2 < x < 0.   8
    = 0,   0 < x < 2

Hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots$

Q3   A   Find $L^{-1}\{\log(1 - \frac{1}{s^2})\}$ 6

B   Find the analytic function f(z)= u + iv where $u + v = \frac{sin2x}{cosh2y - cos2x}$, using   6
    Milne-Thompson's Method.

C   Fit a parabola $x = a + by + cy^2$ for the following data: 8

X:	1	2	3	4	5
Y:	10	12	15	14	15

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Q4 A The first 4 moments of a distribution about origin of the random variable   6
X are -1.5, 17, -30 and 108. Compute Mean, variance, μ_3 and μ_4.

B Consider the equations of regression lines 5x-y=22 and 64x-45y=24.   6
Find $\bar{x}$, $\bar{y}$ and correlation coefficient r.

C Find $L^{-1}\{\dfrac{(s+3)^2}{(s^2+6s+13)^2}\}$ 8

Q5 A Find the Laplace transform of $\cos^3 t \cos 5t$.   6

B Find Spearman's rank correlation coefficient for the data below: 6

X :	32	55	49	60	43	37	43	49	10	20
Y :	40	30	70	20	30	50	72	60	45	25

C Obtain Fourier Series for $f(x) = \frac{1}{2}(\pi - x)$ in $(0, 2\pi)$.

Hence, deduce that $\dfrac{\pi}{4} = 1 - \dfrac{1}{3} + \dfrac{1}{5} - \dfrac{1}{7} + \cdots$ 8

Q6 A If f(x) is probability density function of a continuous random variable X,   6
find k, mean and variance.
$$f(x) = \begin{cases} kx^2, & 0 \le x \le 1 \\ (2-x)^2, & 1 \le x \le 2 \end{cases}$$

B Check if there exists an analytic function whose real part is   6
$u = \sin x + 3x^2 - y^2 + 5y + 4$. Justify your answer.

C Evaluate the following integral by using Laplace transforms   8

$$\int_0^\infty e^{-2t} \left[\int_0^t \left(\frac{e^{3u}\sin^2 2u}{u}\right) du\right] dt$$

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Paper / Subject Code: 50925 / Computer Graphics

S.E /Sem-III /Computer/ May-2024

Date:- 14 |06|2024

Duration: 3 Hours

Total Marks 80

N.B: 1) Question number 1 is compulsory.

2) Attempt any three out of the remaining.

3) Assume suitable data if necessary and justify the assumptions.

4) Figures to the right indicate full marks.

Q.1 Attempt any four   20
 i. Give applications of Computer Graphics.
 ii. What is an antialiasing? Explain any 3 antialiasing techniques.
 iii. Compare DDA and BRESENHAM line drawing algorithm.
 iv. Explain Viewing transformation pipeline.
 v. Give fractal dimension of Koch curve.

Q.2   20
a. Given a line AB where A(0,0) and B(1,3) find out all the coordinates of line AB using DDA algorithm.
b. Describe different traditional animation techniques.

Q.3   20
a. Describe homogeneous coordinates.
b. Describe with neat diagram Boundary Fill and Flood fill algorithm.

Q.4   20
a. Derive window to viewport coordinate transformation.
b. Derive matrix for 2D rotation at any arbitrary (fix) point.

Q.5   20
a. Give properties of Bezier curve.
b. Describe with neat diagram Sutherland Hodgman polygon clipping algorithm.

Q.6   20
a. Describe with neat diagram Depth Buffer algorithm.
b. What is projection? Explain with neat diagram different perspective projections.

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SE/Sem–III/ Comp/ May–2024

Date:- 12/06/2024

(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

a	Draw the Detailed Von- Neumann architecture and explain in brief	05
b	Explain IEEE-754 Floating point Representation	05
c	Explain the difference between Encoder and decoder	05
d	Differentiate between Hardwired control unit and Micro programmed control unit	05

a	List out the basic and universal logic gates with the symbol, truth table, output expression	05
b	What do you mean by BCD? Perform 792 + 128 using BCD addition	05
c	Explain the various Addressing Modes	10

a	What is the difference between Computer organization and Computer architecture explain it with a example	05
b	List & explain the characteristics of memory	05
c	Draw the Flowchart for the Booth's Algorithm for signed integer multiplication and perform the multiplication between –6 and 2 using this Algorithm	10

a	List the various methods to design the Hardwired control unit and explain any one	05
b	Explain the Micro instruction format	05
c	Explain Flynn's Classification	10

a	List and explain the various pipeline Hazards	05
b	Write a microprogram to represent the Interrupt cycle	05
c	Consider a 2-way set associative mapped cache of size 16 KB with block size 256 bytes. The size of main memory is 128 KB. Find- 1. Number of bits in tag 2. Tag directory size	10

a	Represent -7.14 using double precision format of IEEE 754 standards	05
b	Explain the concept of locality of reference	05
c	Explain the various Bus arbitration methods	10

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Paper / Subject Code: 50923 / Data Structure

S.E./Sem-III/Comp/May-June-2024

10/06/2024

(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.

Q.1	(a)	Differentiate between linear and non-linear data structures.	[05]
	(b)	Evaluate postfix expression "78+45-*" using stack. Show stack contents at each step.	[05]
	(c)	Explain the various ways to represent graph in the memory with example.	[05]
	(d)	Write a C function to insert and delete an item in linear queue as linked list.	[05]
Q.2	(a)	Construct Huffman tree for the letters in the string "structures" and find the Huffman codes for each symbol in the string.	[10]
	(b)	Write C program for infix to postfix conversion.	[10]
Q.3	(a)	Write a C program to perform following operations on a doubly linked list: i) insert a node from the end of the list, ii) delete first node, iii) display the list.	[10]
	(b)	Write a C functions to insert and delete elements with respect to binary search tree.	[10]
Q.4	(a)	Construct an AVL tree by inserting the following elements in the given order: 74, 23, 120, 65, 11, 31, 42, 55, 98, 7.	[10]
	(b)	Explain the double ended queue. Explain its types.	[05]
	(c)	Define topological sorting. Explain the same with suitable example.	[05]
Q.5	(a)	Given the values {91, 82, 43, 37, 69, 24, 61}, a hash table of size 7 and a hash function $h(k) = k \bmod 7$, show the resulting table after inserting the values in the given order with Linear probing.	[10]
	(b)	Write an algorithm to check the well-formedness of parenthesis in an algebraic expression using the Stack data structure.	[10]
Q.6	(a)	Insert the given elements in the following B-tree of order-3: 75, 59, 86, 64, 53, 40, 29, 4.	[10]

```
       ┌────┐
       │ 67 │
       └────┘
      /        \
┌────┐          ┌────┐
│ 33 │          │ 89 │
└────┘          └────┘
```
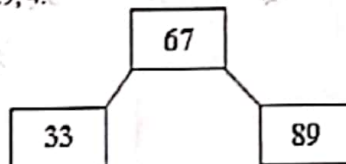
Show the B tree at each step of insertion.

	(b)	Write a function in C for BFS traversal of graph. Explain DFS graph traversal with suitable example.	[10]

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Paper / Subject Code: 50922 / Discrete Structures & Graph Theory

S.E / Sem III | Computer / May - June 24

06/06/2024.

Duration: 3 Hours   **Total Marks: 80**

N.B. : 1) Question Number 1 is compulsory

2) Solve any three questions from the remaining questions

3) Make suitable assumptions if needed

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

|			
Q.1		Solve any four of the following questions.	
	a.	What is a tautology? Check whether the following logical expression is tautology? $[(p \rightarrow r) \wedge (\sim q \rightarrow p) \wedge \sim r] \rightarrow q$	5
	b.	State the Pigeonhole principle and show that if any five numbers form 1 to 8 are chosen, then two of them will add to 9.	5
	c.	Convert the following into CNF form. $(A \rightarrow B) \rightarrow ((B \rightarrow C) \rightarrow (A \rightarrow C))$	5
	d	Given $S = \{1, 2, ..., 10\}$ and a relation R on S, where $R = \{(x, y)| x + y = 10\}$. Is it reflexive, symmetric, transitive, antisymmetric?	5
	e	Define the following terms 1. Planer graph 2. Cut Vertex 3.Chain 4. Monoid 5.Group	5
Q.2	a	Let A= {p,q,r,s} and let R={(p,p),(p,q),(p,r),(q,p),(q,q),(r,p),(q,r),(r,q),(r,r),(s,s) }. Show that R is an equivalence relation . Determine the equivalence classes and find the rank of R.	8
	b.	Show that A={0,3,6,9,12} is a ring w.r.t. the operation of addition & multiplication modulo 15.	8
	c	Explain two different types of Quantifiers with example? Represent the following sentences using First Order logic i) Some students took GenAI. ii)Every student who takes GenAI passes it.	4
Q.3	a	What is an Abelian Group? Let G = { 1,2,3,4,5,6,7} i) Prepare the composition table w.r.t the operation of multiplication modulo 8. ii) Check whether it is an Abelian group? Justify your answer.	8
	b	Define minimum hamming distance. Find the code words generated by the parity check matrix H given below.	8

$$H= \begin{matrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{matrix}$$

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c

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Determine whether the following graph is Eulerian or Hamiltonian or both. Justify your answer.
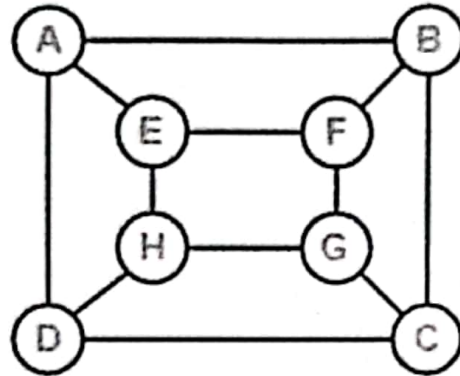
Q.4 a Define function. What are three different types of functions.. Consider the function f and g from N x N to N given by $f(x,y) = 2x+y$ and $g(x,y)= xy$,identify its type.

8

b Let A= {a,b,c,d,e} and let R be a relation on A.
Let R={(a,a),(a,c),(b,b),(c,d),(c,e),(d,a),(e,b),(e,e)}
Compute transitive closure using Warshall's algorithm

8

c Prove using Mathematical Induction that sum of cubes of three consecutive integers is divisible by 9.

4

Q.5 a Let X={1,2,3,4,6,24,36,72} and R ={(x,y) ∈ R | x divides y}
i) Write the pairs in a relation set R.
ii) Construct Hasse diagram.
iii) Mention Chains and Anti Chains from above set.
iv) Is it a lattice?

8

b Find the number of integers between 1 to 500 that are not divisible by 5,6, or 8?

8

c Check whether the following graphs are Isomorphic or not? Justify

4

X1118Y283F67X1118Y283F67X1118Y283F67X1118Y283F67
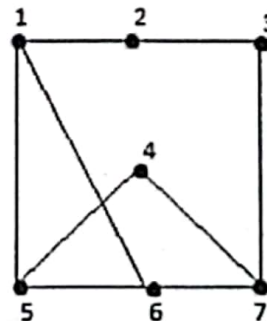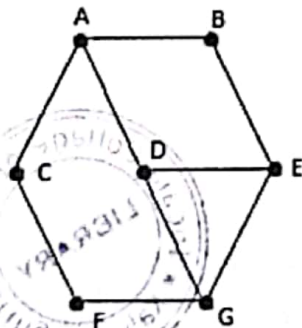
Q.6.

a Draw the Hasse Diagram of D_{72} 8
  i)Find the complement of each element
  ii) Check whether it is a Distributive Lattice

b Let $f(x) = x + 3$, $g(x) = x - 3$ and $h(x) = 3x$ for $x \in R$, where R is the set of real   8
  numbers.
  Find i)g $\circ$ h   ii) f $\circ$ g.   i)g $\circ$ h $\circ$ f   ii) f $\circ$ h $\circ$ g

c Find the generating functions for the following sequences: 4
      a. 0, 0, 0, 1, 2, 3, 4, 5, 6, 7,..............................
      b. 6, -6, 6, -6, 6, -6,...

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