SE Computer Sem-III Dec.-2019.

Paper / Subject Code: 50901 / Applied Mathematics-III

S.E. (Computer Engg) Sem III Choice base Dt 14/11/19 1/2

Total Marks:80

Duration: 3Hrs

NB 1. Question No.I is compulsory.
2. Attempt any **three** from the remaining six questions.
3. Figures to the right indicate full marks.

Q1a. If $L\{tsin\omega t\} = \frac{2\omega s}{(s^2+\omega^2)^2}$, find $L\{\omega t cos\omega t + sin\omega t\}$ [20]

b. If $f(z) = (x^2 + axy + by^2) + i(cx^2 + dxy + y^2)$ is analytic ,find a,b,c and d

c. **Find** the Fourier series expansion of $f(x) = x^3 \ (-\pi, \pi)$

d. If the two regression equations are $4x - 5y + 33 = 0, 20x - 9y - 107 = 0$ find i) the mean values of x and y

ii) the Correlation Coefficient iii) Standard deviation of y if variance of x is 9

Q2 a. Show that the function is Harmonic and find the Harmonic Conjugate
$u = cosx\ coshy - 2xy$ [6]

b. Evaluate $\int_0^\infty e^{-t}(\int_0^t u^2\ sinhu\ coshu\ du)dt$) using Laplace Transform. [6]

c. Find Fourier Series expansion of $f(x) = x \quad -1 < x < 0$
$= x + 2 \quad 0 < x < 1$ [8]

Q3 a. Find the Analytic function $f(z) = u + iv$ if $u - v = e^x(cosy - siny)$ [6]

b. Find Inverse Z transform of $\frac{5z}{(2z-1)(z-3)} \quad \frac{1}{2} < |z| < 3$ [6]

c. Solve the Differential Equation using Laplace transform
$(D^2 - 2D + 1)y = e^t, y(0) = 2, y'(0) = -1$ [8]

Q4 a. Find the Complex Form of Fourier Series for $f(x) = cosax \ (-\pi, \pi)$ [6]

b. Find the Spearman's Rank correlation coefficient between X and Y. [6]

X	68	64	75	50	64	80	75	40	55	64
Y	62	58	68	45	81	60	68	48	50	70

c. Find the inverse Laplace transform of i) $\frac{s-1}{s^2+2s+2}$ ii) $\frac{e^{-\pi s}}{s^2(s^2+1)}$ [8]

QPC 76058

S.E. (Computer Engg) Sem III Chairbore dt 14/11/19 (2/2)

Q5 a. Find the $Z\{f(k)\}$ where $f(k) = 4^k, k < 0$
$= 3^k, k \geq 0$ [6]

b. Show that $\{cosx, cos2x, cos3x, \ldots\ldots\}$ is orthogonal set over the interval $[0,2\pi]$. Construct the corresponding orthonormal set. [6]

c. Find the bilinear transformation which maps the points $z = 1, i, -1$ into the points $w = i, 0, -i$, Hence find the image of $|z| < 1$. [8]

Q6 a. Fit a straight line to the given data [6]

X	10	12	15	23	20
Y	14	17	23	25	21

b. Find Inverse Laplace Transform using Convolution theorem $\frac{1}{(s-2)^3(s+3)}$ [6]

c. Find Half Range Cosine Series for $f(x) = sinx$ in $(0,\pi)$ and hence deduce that
$\frac{\pi^2-8}{16} = \frac{1}{1^2.3^2} + \frac{1}{3^2.5^2} + \frac{1}{5^2.7^2} + \cdots\ldots\ldots$ [8]

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Paper / Subject Code: 49801 / APPLIED MATHEMATICS- III

Paper/Subject Code: 49301/Applied Mathematics-III -IT -Comp

Time Duration: 3Hr **Total Marks: 80**

N.B.:1) Question no.1 is compulsory.
2) Attempt any three questions from Q.2to Q.6.
3) Figures to the right indicate full marks.

Q1. a) Find the Laplace transform of $e^{-4t}t\sin 3t$. [5]

b) Find the half-range cosine series for $f(x) = x,\ 0 < x < 2$. [5]

c) Find $\nabla.\left(r\,\nabla\frac{1}{r^3}\right)$. [5]

d) Show that the function $f(z) = \sin z$ is analytic and find $f'(z)$ in terms of z. [5]

Q2. a) Find the inverse Z-transform of $F(z) = \frac{1}{(z-5)^3}$, $|z| < 5$. [6]

b) Find the analytic function whose imaginary part is $e^{-x}(y\sin y + x\cos y)$. [6]

c) Obtain Fourier series for the function $f(x) = x + x^2$, $-\pi \le x \le \pi$ and $f(x + 2\pi) = f(x)$. [8]

Hence deduce that $\frac{\pi^2}{6} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \cdots$ and $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots$

Q3. a) Find $L^{-1}\left[\frac{1}{(s-a)(s-b)}\right]$ using convolution theorem. [6]

b) Is S= $\left\{\sin\left(\frac{\pi x}{4}\right), \sin\left(\frac{3\pi x}{4}\right), \sin\left(\frac{5\pi x}{4}\right), \ldots\ldots\right\}$ orthogonal in (0 , 1)? [6]

c) Using Green's theorem in the plane evaluate $\int_c (xy + y^2)dx + (x^2)dy$ where C is the closed curve of the region bounded by $y = x$ and $y = x^2$. [8]

Q4. a) Find Laplace transform of $f(t) = \begin{cases} \sin 2t & ,0 < t \le \frac{\pi}{2} \\ 0 & ,\frac{\pi}{2} < t < \pi \end{cases}$ and $f(t) = f(t + \pi)$. [6]

b) Prove that a vector field $\bar{f}$ is irrotational and hence find its scalar potential $\bar{f} = (x^2 + xy^2)\,i + (y^2 + x^2y)j$. [6]

c) Find the Fourier expansion for $f(x) = \sqrt{1 - \cos x}$ in $(0\ ,\ 2\pi)$. Hence deduce that $\frac{1}{2} = \sum_1^\infty \frac{1}{4n^2-1}$. [8]

Q5.a) Use Gauss's Divergence Theorem to show that $\iint_S \nabla r^2 \overline{ds} = 6V$ where S is any closed surface enclosing a volume V. [6]

b) Find the Z-transform of $f(k) = b^k$, k< 0 . [6]

c) i) Find $L^{-1}\left[\frac{s}{(s-2)^6}\right]$. [8]

ii) Find $L^{-1}\left[\log\left(1 + \frac{a^2}{s^2}\right)\right]$.

Q6.a) Solve using Laplace transform [6]
$(D^2 + 9)y = 18t$, given that $y(0) = 0$ and $y\left(\frac{\pi}{2}\right) = 0$

b) Find the bilinear transformation which maps the points Z=∞, i, 0 onto W=0, i, ∞ . [6]

c) Find Fourier integral representation of $f(x) = e^{-|x|}$ $-\infty < x < \infty$. [8]

Sp Code 67960

S.E. Com Sem III Dec-2019

Paper / Subject Code: 50902 / Digital Logic Design and Analysis

S-E (Comp) - sem III - choice Base - 18/11/19 (Y1)

Time: 3 Hours **Marks: 80**

N.B. : 1. Question One is Compulsory.
2. Solve any Three out of remaining.
3. Draw neat and clear diagrams.
4. Assume suitable data if required

Q1	a)	What are universal gates? Why are they called so? Explain with suitable example.	4M
	b)	Perform following subtractions using 7's complement method. a) $(20)_5 - (14)_5$ b) $(20)_{10} - (15)_{10}$	4M
	c)	Perform $(34)_{10} - (12)_{10}$ in BCD using 10's complement method	4M
	d)	Explain lockout condition. How can it be avoided	4M
	e)	If the 7 bit hamming code word received by receiver is 1011011, assuming the even parity, state whether the received code word is correct or wrong? If wrong locate the bit having error and extract corrected data.	4M
Q2	a)	Reduce using Quine McClusky Method & realize the operation using NOR gates only. $F(A,B,C,D) = \Sigma m(0,1,2,8,10,11,14,15)$	10M
	b)	Explain one digit BCD adder	10M
Q3	a)	Construct 32:1 MUX using 8:1 MUX only. Also comment about select lines used.	10M
	b)	Solve the following using K-Map $F(A,B,C,D) = \pi M(3,4,5,6,7,10,11,15)$	5M
	c)	Design full adder using half adders and few gates	5M
Q4	a)	Convert SR Flip flop to JK flip flop and T flip flop	10M
	b)	Design 3-bit asynchronous up-down counter	10M
Q5	a)	Design 4-bit Binary to Gray Code Convertor.	10M
	b)	What is race around condition? How it is overcome in Master Slave JK Flip Flop?	5M
	c)	Design 1-Bit Magnitude comparator using logic gates.	5M
Q6		Write a short note on any Four	20M
	a)	VHDL Modelling Styles	
	b)	TTL and CMOS Logic Families	
	c)	SISO and PISO Shift Registers	
	d)	ALU	
	e)	Twisted ring counter	

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Qp – 76197

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S.E (comp) – Sem III – choice Base – 20/11/19 (1/2)

(3 hrs) Max. Marks: 80

1) Question **no.1** is **compulsory**.
2) Solve any **three** questions out of remaining **five** questions.
3) All questions carry equal marks as indicated by figures to the right.
4) Assume appropriate data whenever required. State all assumptions clearly.

Q.1 a) Prove using Mathematical Induction (05M)

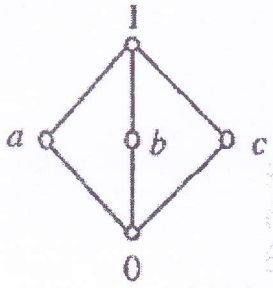
$1^2 + 2^2 + 3^2 + \ldots + n^2 = n(n+1)(2n+1)/6$

b) Let A = {a,b,c}. Draw Hasse Diagram for $(p(A), \subseteq)$ (05M)

c) Let A={1,2,3,4,5}. A relation R is defined on A as aRb iff a<b. Compute R^2 and R^∞ (05M)

d) Let f : R O R, where $f(x) = 2x - 1$ and $f^{-1}(x) = (x+1)/2$ (05M)
Find $(f \circ f^{-1})(x)$

Q.2 a) Define Distributive Lattice. Check if the following diagram is a Distributive lattice or not. (04M)



b) Prove that set G = {1,2,3,4,5,6} is a finite abelian group of order 6 with respect to multiplication module 7 (08 M)

c) Find the number of positive integers not exceeding 100 that are not divisible by 5 or 7. Also draw corresponding Venn Diagram. (08 M)

Q.3 a) Construct Truth Table and check if the following statement is tautology.

$(P \rightarrow Q) \leftrightarrow (\neg Q \rightarrow \neg P)$ (04 M)

b) Consider the (2,5) group encoding function defined by (08 M)

e(00)=00000 e(10)=10101
e(01)=01110 e(11)=11011

Decode the following words relative to a maximum likelihood decoding function.
i) 11110 ii) 10011 iii) 10100

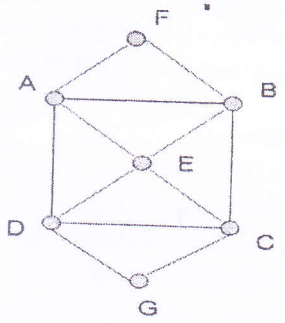
c) How many four digits can be formed out of digits 1,2,3,5,7,8,9 if no digit is repeated twice? How many of these will be greater than 3000? (08 M)

Q.4 a) A bag contains 10 red marbles, 10 white marbles, and 10 blue marbles. What is the minimum no. of marbles you have to choose randomly from the bag to ensure that we get 4 marbles of same color? Use pigeonhole Principle. (04 M)

QP – 77261

S E (comp) – sem III – choice Base – 20/11/19 (2/2)

b) Define Euler Path, Euler Circuit, Hamiltonian Path and Hamiltonian Circuit. Determine if following diagram has Euler Path, Euler Circuit, Hamiltonian Path and Hamiltonian Circuit and state the path /circuit. (08 M)



c) In how many ways a committee of three faculty members and 2 students can be formed from 7 faculty members and 8 students. (08 M)

Q.5 a) Let Z_n denote the set of integers {0,1,2,...n-1}. Let ⊙ be a binary operation on Z_n such that a ⊙ b= reminder of ab divided by n (04M)

i) Construct table for the operation ⊙ for n=4

ii) Show that (Z_n, ⊙) is a semi group for any n

b) Find Transitive Closure of R represented by M_R as follows using Warshall's algorithm set {a,b,c,d}. (08M)

$$M_R = \begin{vmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{vmatrix}$$

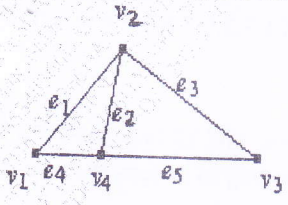
c) Let A = {1, 2, 3, 4, 5}, and let

R = {(1, 1),(1, 3),(1, 4),(2, 2),(2, 5),(3, 1),(3, 3),(3, 4),(4, 1),(4, 3),(4, 4),(5, 2),(5, 5)}. Check if R is a equivalence relation. Justify your answer. Find equivalence classes of A. (08M)

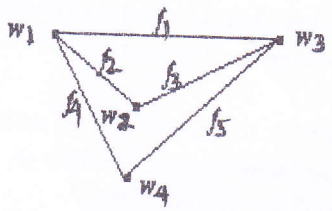
Q.6 a) How many vertices are necessary to construct a graph with exactly 6 edges in which each vertex is of degree 2. (04 M)

b) What is the solution of the recurrence relation $a_n = -a_{n-1} + 4a_{n-2} + 4a_{n-3}$ with $a_0=8$, $a_1=6$ and $a_2=26$? (08M)

c) Determine if following graphs G_1 and G_2 are isomorphic or not. (08M)



G_1



G_2

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Qp :- 77261

S.E Computer Sem-III choice based 22/11/19

(3 Hours) [Total Marks : 80]

N.B. : 1. Question **One** is **Compulsory.**
2. Solve any **Three** out of remaining.
3. **Draw** neat and **clear** Diagrams.
4. Assume suitable **data** if required

Q.1. Attempt the following

A. Represent an AM signal both in time domain and frequency domain giving their mathematical equation for e_{AM}. 05

B. List the ideal and practical characteristics with their values for an op-amp. 05

C. What is DC load line? What is the importance of Q-point selection on a DC load line? 05

D. What are the differences between PAM, PWM and PPM? 05

Q.2.

A. Explain with neat diagram, the working of Hartley Oscillator using transistor. 10

B. Describe the working of class A and Class C power Amplifier in detail with relevant diagrams. 10

Q.3.

A. Explain the application of op-amp as differentiator. 10

B. Explain the need of biasing and stabilization. In a Silicon transistor circuit with a fixed bias, V_{CC}=9V, R_C=0.5KΩ, R_B=60KΩ, β=60, V_{BE}=0.7V. Find the operating point on DC load line. 10

Q.4.

A. What is the role of multiplexing in communication system? Explain TDM in detail. 10

B. Explain how Op-Amp can be used as inverting summer. 10

Q.5.

A. Derive the formula of total power in AM. An AM signal has a total power of 48 Watts with 45% modulation. Calculate the power in the carrier and the sidebands. 10

B. Draw Input and output characteristics of CE Configuration. 05

C. Explain Zero Crossing Detector using Op-amp 741. 05

Q.6.

A. Define measures of information. A source puts out one of five possible symbols once every millisecond. The probabilities of these symbols are 1/2, 1/4, 1/8, 1/16 and 1/16. Find information rate and Entropy. 10

B. Draw waveforms of natural and flat top sampling signal for a given sine wave signal 05

C. Draw block diagram of super-heterodyne receiver with waveforms for each block. 05

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Op Code 76195

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Paper / Subject Code: 50905 / Data Structures

S.E (Computer) Sem-III choice Based 26/11/19

Duration: 3 hrs **Total Marks: 80**

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

1 (a) Define Data Structure. Differentiate linear and non-linear data structures with example. **(5)**
(b) Write a C function to implement Insertion sort. **(5)**
(c) What are different ways to represent graphs in memory? **(5)**
(d) What is expression tree? Derive an expression tree for (a+(b*c))/((d-e)*f) **(5)**

2 (a) What is Hashing? Hash the following data in a table of size 10 using linear probing and quadratic probing. Also find the number of collisions. **(10)**
63, 82, 94, 77, 53, 87, 23, 55, 10,44
(b) Write a recursive function to perform pre-order traversal of a binary tree **(8)**
(c) Given an array int a[] = {23,55,63,89,45,67,85,99}. Calculate address of a[5] if base address is 5100. **(2)**

3 (a) Write a C program to convert infix expression to postfix expression. **(10)**
(b) Demonstrate step by step insertion of the following elements in an AVL tree. **(10)**
63, 9, 19,18,108,99,81,45

4 (a) Write a C program to implement circular linked list that performs following functions **(12)**
-Insert a node in the beginning
-Insert a node in the end
-Count the number of nodes
-Display the list
(b) Given the frequency for the following symbols, compute the Huffman code for each symbol. **(8)**

Symbol	A	B	C	D	E	F
Frequency	9	12	5	45	16	13

5 (a) Explain Double Ended Queue. Write a C program to implement Double Ended Queue **(12)**
(b) Given the postorder and inorder traversal of a binary tree, construct the original tree: **(8)**
Postorder: D E F B G L J K H C A
Inorder: D B F E A G C L J H K

6 Explain following with suitable example (any two) **(20)**
I. B-tree and splay tree
II. Polynomial representation and addition using linked list
III. Topological Sorting

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Dp Code 77805