Paper / Subject Code: 49801 / APPLIED MATHEMATICS- III

Time: 3 Hours **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 $e^{-t}t\cosh 2t$. **[5]**

b) Find the half-range cosine series for $f(x)=\begin{cases}1 & ,o<x<\frac{a}{2}\\ -1 & ,\frac{a}{2}<x<a\end{cases}$ **[5]**

c) Find $\nabla\left(\bar{a}.\nabla\frac{1}{r}\right)$ where $\bar{a}$ is a constant vector. **[5]**

d) Show that the function $f(z)=z^3$ is analytic and find $f'(z)$ in terms of z. **[5]**

Q2. a) Find the inverse Z-transform of $F(z)=\frac{3z^2-18z+26}{(z-2)(z-3)(z-4)}$,$3<z<4$. **[6]**

b) Find the analytic function whose imaginary part is $\tan^{-1}\left(\frac{y}{x}\right)$. **[6]**

c) Obtain Fourier series for the function $f(x)=\begin{cases}\frac{\pi}{2}+x & ,-\pi<x<0\\ \frac{\pi}{2}-x & ,0<x<\pi\end{cases}$, **[8]**

Hence ,deduce that $\frac{\pi^2}{8}=\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\cdots$ and $\frac{\pi^4}{96}=\frac{1}{1^4}+\frac{1}{3^4}+\frac{1}{5^4}+\cdots$

Q3. a) Find $L^{-1}\left[\frac{s^2}{(s^2+1)(s^2+4)}\right]$ using convolution theorem. **[6]**

b) Show that the set of functions $\phi_n(x)=\sin\left(\frac{n\pi x}{l}\right), n=1,2,3\ldots$ is orthogonal in $[0\ ,l]$. **[6]**

c) Using Green's theorem evaluate $\oint_C\left(e^{x^2}-xy\right)dx-(y^2-ax)dy$ where C is the circle $x^2+y^2=a^2$. **[8]**

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

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

c) Obtain the Fourier expansion of $f(x)=\left(\frac{\pi-x}{2}\right)^2$ in the interval $0\le x\le 2\pi$ and $f(x+2\pi)=f(x)$ .Also deduce that $\frac{\pi^2}{8}=\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\cdots$ **[8]**

Q5.a) Use Gauss's Divergence Theorem to evaluate $\iint_S \bar{N}.\bar{F}ds$ where $\bar{F}=4xi+3yj-2zk$ and S is the surface bounded by x=0, y=0, z=0 and 2x+2y+z=4. **[6]**

b) Find the Z-transform of $f(k)=ke^{-ak}$, k≥ 0 . **[6]**

c) i) Find $L^{-1}\left[\frac{s+2}{s^2(s+3)}\right]$. **[8]**

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

Q6.a) Solve using Laplace transform **[6]**
$(D^2+3D+2)y=2(t^2+t+1)$, with $y(0)=2$ and $y'(0)=0$.

b) Find the bilinear transformation which maps the points Z=1, i, -1 onto the points W=i, 0, -i . **[6]**

c) Find Fourier sine integral of $f(x)=\begin{cases}x & ,0<x<1\\ 2-x & ,1<x<2\\ 0 & ,x>2\end{cases}$ **[8]**

1T00713 - S.E.(COMPUTER)(Sem III) (CBSGS) / 49303 - DATA STRUCTURES

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) What is a data structure? Explain with examples. **(05)**
   (b)What are the advantages of using dynamic memory allocation over static memory allocation? **(05)**
   (c) Describe Multiway Search Tree with an example. **(05)**
   (d) Write a function in C to implement Shell Sort. **(05)**

2. (a) Discuss file I/O operations in C programming language. **(10)**
   (b)Explain sparse matrix as application of linked list with examples. **(10)**

3. (a) How can we use the QUEUE data structure for simulation? Explain with an example. **(10)**
   (b)Write a function to implement Radix Sort. Sort the following numbers using Radix Sort:
   25, 10, 68, 19, 75, 43, 22, 31, 11, 59. Show output after each pass. **(10)**

4. (a) Write a C program to implement a Circular Linked List which performs the following operations: **(12)**
   (i) Inserting element in the beginning
   (ii) Inserting element in the end
   (iii) Inserting element after an element
   (iv) Deleting a particular element
   (v) Displaying the list
   (b) Apply Huffman Coding for the word “MALAYALAM”. Give the Huffman code for each symbol. **(08)**

5. (a) Explain any one application of stack with an example. **(08)**
   (b)Write a program in C to delete a node from a Binary Search Tree. The program should consider all the possible cases. **(12)**

6. (a) Write a program in C to implement the BFS traversal of a graph. Explain the code with an example. **(10)**
   (b) Hash the following in a table of size 11. Use any two collision resolution techniques: **(10)**
   23, 55, 10, 71, 67, 32, 100, 18, 10, 90, 44.

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Time: 3 Hours **Marks: 80**

N.B. (1) Question No. 1 is compulsory
(2)Assume suitable data if necessary
(3)Attempt any three questions from remaining questions

1

(a) Convert $(47.3)_7$ to BCD, Excess-3 and gray code. (3)
(b) Perform $(2F9)_H - (1AD)_H$ without converting to any other base. (3)
(c) Subtract $(64)_{10} - (31)_{10}$ using 2's complement. (4)
(d) Explain race around condition. (4)
(e) Prove OR-AND configuration is equivalent to NOR-NOR configuration. (4)
(f) Obtain hamming code for data 1101. (2)

2 (a) Simplify following function using Quine McCluskey method and realize circuit using basic gates. (10)
$F(A,B,C,D) = \sum m(0,1,3,5,7,9,11,15) + d(2,14)$
(b) Design 1-bit magnitude comparator. (10)

3 (a) Compare different logic families with respect to fan in, fan out, speed, propogation delay and power dissipation. (5)
(b) Simplify $Y = \overline{A}\,\overline{B}\,\overline{C} + A\,\overline{B}\,\overline{C} + A\,\overline{B}\,C$ (5)
(c) Implement the following using only one 8:1 Mux and few gates. (10)
$F(A,B,C,D) = \sum m(0, 1, 5, 7, 9, 10, 15)$

4 (a) Convert D flip-flop to JK flip-flop and JK flip-flop to D flip-flop. (10)
(b) Design a full adder using only NAND gates. (10)

5 (a) Design mod -6 asynchronous UP counter. (10)
(b) Write short note on VHDL . (10)

6 (a) Explain Astable and Bistable multivibrators. (10)
(b) Explain 4-bit bidirectional shift register. (10)

S.E.(COMPUTER)(Sem III) (CBSGS) / 49302 - ELECTRONIC CIRCUITS AND COMMUNATION FUNDAMENTALS **Q. P. Code: 35354**

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

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

Q.1. Attempt the following
a) Explain the construction of n-channel JFET 5
b) List the ideal Characteristics of Op-amp 5
c) What is modulation in communication?What is the need for modulation? 5
d) Compare TDM and FDM 5

Q.2. A. Explain Barkhausen Criteria for Oscillation. Calculate the frequency of oscillations of Colpitt's oscillator with $C_1 = C_2 = 500$ pF and L=1mH 10
B. Derive the equations for Zi,Zo,Av for common source configuration using voltage divider network 10

Q.3. A. Explain how op-amp can be used as averaging amplifier in inverting configuration 10
B. Explain generation of SSB using phase shift method. 10

Q.4. A. Explain Superheterodyne reciever in detail and show waveforms at each stage 10
B. State and proof Sampling theorem for Low pass Signal. 10

Q.5. A. Discuss Delta Modulation and Adaptive Delta Modulation 10
B. Write short note on TDM-PCM System 10

Q.6 . Write Short note on
a) PLL 10
b) Op-amp as Comparator 10

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