SE, SEM III, COMPUTER (CHOICEBASE) MAY 2019

Q. P. Code: 21237

Time: 3 Hours **Marks: 80**

Note : 1) Q.1 is COMPULSORY.

2) Attempt ANY 3 questions from Q.2 to Q.6

3) Use of scientific calculators allowed.

4) Figures to right indicate marks.

Q.1 a) Find the Laplace transform of $t\,e^t \sin 2t \cos t$. (05)

b) Find the inverse Laplace transform of $\frac{s+2}{s^2(s+3)}$ (05)

c) Determine whether the function $f(z) = x^2 - y^2 + 2ixy$ is analytic and if so find its derivative. (05)

d) Find the Fourier series for $f(x) = e^{-|x|}$ in the interval $(-\pi, \pi)$. (05)

Q.2 a) Evaluate $\int_0^\infty \frac{e^{-t} - \cos t}{te^{4t}}\,dt$ (06)

b) Find the Z- Transform of $f(k) = \begin{cases} 3^k, & k < 0 \\ 2^k, & k \geq 0 \end{cases}$ (06)

c) Show that the function $u = 2x(1 - y)$ is a harmonic function. Find its harmonic conjugate and corresponding analytic function. (08)

Q.3 a) Find the equation of the line of regression of y on x for the following data (06)

X	10	12	13	16	17	20	25
y	19	22	24	27	29	33	37

b) Find the bilinear transformation which maps $z = 2, 1, 0$ onto $w = 1, 0, i$. (06)

c) Obtain the expansion of $f(x) = x(\pi - x)$, $0 < x < \pi$ as a half range cosine series.

Hence show that $\sum_1^\infty \frac{(-1)^{n+1}}{n^2} = \frac{\pi^2}{12}$. (08)

Q.4 a) Find the inverse Laplace Transform by using convolution theorem

$\frac{1}{(s^2+1)(s^2+9)}$ (06)

b) Calculate the coefficient of correlation between Price and Demand. (06)

Price : 2, 3, 4, 7, 4.

Demand : 8, 7, 3, 1, 1.

c) Find the inverse Z-transform for the following ; (08)

i) $\frac{z}{z-5}$, $|z| < 5$ ii) $\frac{1}{(z-1)^2}$, $|z| > 1$

Q.5 a) Find the Laplace transform of e^{-t} sint H(t - π) (06)

b) Show that the set of functions { sinx , sin3x , sin5x , …….} is orthogonal over [0, π/2]. Hence construct orthonormal set of functions. (06)

c) Solve using Laplace transform $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + y = 3t\,e^{-t}$, given y(0) = 4 and y ’(0) = 2. (08)

Q.6 a) Find the complex form of Fourier series for f(x) = 3x in (0, 2π). (06)

b) If f(z) is an analytic function with constant modulus then , prove that f(z) is constant. (06)

c) Fit a curve of the form $y = ax^b$ to the following data. (08)

x	1	2	3	4
y	2.5	8	19	50

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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 Attempt ant 5

(a) Convert $(451.43)_{10}$ into octal, binary and hexadecimal and base 7. (4)
(b) Subtract using 1's and 2's complement method $(73)_{10} - (49)_{10}$ (4)
(c) Perform $(52)_{10} - (68)_{10}$ in BCD using 9's complement. (4)
(d) State De Morgan's theorem. Prove OR-AND configuration is equivalent to NOR-NOR configuration. (4)
(e) Encode the data bits 111010001using Hamming code. (4)
(f) Explain SOP and POS and solve the following using K-Map
F(A,B,C,D)=πM(1,3,5,6,7,10,11)+d(2,4) (4)
(g) Explain lockout condition. How can it be avoided (4)

2 (a) Reduce equation using Quine McCluskey method and realize circuit using basic gates. (10)
F(A,B,C,D) = ∑m (1,5,6,12,13,14) + d(2,4)
(b) Design 4-bit BCD subtractor using IC 7483. (10)

3 (a) Implement the following using only one 8:1 Mux. (5)
F(A,B,C,D) = ∑m (0,2,4,6,8,10,12,14)
(b) Design a Full Subtractor using only NAND gates. (5)
(c) Design a logic circuit to convert 4-bit gray code to its corresponding BCD code. (10)

4(a) Compare different logic families with respect to fan in, fan out, speed, Propogation delay and power dissipation. (5)
(b) Implement 3 bit binary to gray code converter using Decoder. (5)
(c) Explain 4 bitbidirectional shift register. (10)

5 (a) Design mod 13 synchronous counter using T flipflop (10)
(b) Convert SR flipflop to JK flipflop and D flipflop. (10)

6 Write short note on (any four):- (20)
(a) ALU
(b) 3 bit Up/Down Asynchronous Counter
(c) Octal to Binary Encoder
(d) 4-bit Universal shift register
(e) VHDL

(3 Hours) Total Marks: 80

NB: (1) Question No.1 is compulsory
(2) Attempt any 3 questions from remaining Q2 to Q6
(3) Each question is of 20 marks
(4) Figures to right indicates full marks

Q.1- a) Explain Extrinsic pathway of Programmed Cell Death 10
b)Explain the movement of materials through Golgi complex 10

Q.2 Write Short Notes for the following. 20
a) Dynein
b) Cell wall
c) Fibronectin
d) Tight Junction

Q.3 Explain in detail the interaction of cells with other cells 20

Q.4 a) Explain the structure and reproduction of Virus 10
b) Explain in detail about Auto, para and endocrine cell signalling. 10

O.5 a) Explain the different types of Passive Transport across the membrane 10
b) Explain the receptor dimerization and Protein activation of RTK 10

Q.6 a) Explain in detail about Gap Junction and Plasmodesmata 10
b) Explain the structure and assembly of Microfilaments 10

Time: 3 Hours **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

Q.1 (a) Explain Linear and Non-Linear data structures. (5)
(b) Explain Priority Queue with example. (5)
(c) Write a program in 'C' to implement Quick sort. (10)

Q.2 (a) Write a program to implement Circular Linked List. Provide the following operations: (10)
(i) Insert a node .
(ii) Delete a node
(iv) Display the list
(b) Explain Threaded Binary tree in detail (10)

Q.3 (a) Explain Huffman Encoding with suitable example (10)
(b) Write a program in 'C' to check for balanced parenthesis in an expression using stack (10)

Q.4 (a) Write a program in 'C' to implement Queue using array. (10)
(b) Explain different cases for deletion of a node in binary search tree. Write function for each case (10)

Q.5 (a) Write a program in 'C' to implement Stack using Linked-List .Perform the following operations: (10)
(i) Push
(ii) Pop
(iii) Peek
(iii) Display the stack contents
(b) Explain Depth First search (DFS) Traversal with an example. Write the recursive function for DFS (10)

Q.6. Write Short notes on (any two) (20)
(a) Application of Linked-List –Polynomial addition
(b) Collision Handling techniques
(c) Expression Tree
(d) Topological Sorting

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