

Odd Semester Examination, 2022
UG Section
Sub: Indian Constitution (UCCUGAU03)

Full Marks: 80

Time: 3hrs

1. Answer the following questions: (within 30 words each) $2 \times 5 = 10$

- a. Define 'Fundamental Rights'.
- b. What Principles were added to the Constitution of India by the 42nd Amendment Act?
- c. Discuss Article 21A of the Constitution of India.
- d. Discuss any two functions of the Speaker of the Lok Sabha.
- e. Discuss the composition of the Upper House of the Indian Parliament.

2. Write any six questions: (within 100 words each) $5 \times 6 = 30$

- a. Write a short note on the writs of Habeas Corpus and Mandamus.
- b. Discuss in brief Articles 23 and 24 as enumerated in Part III of the Constitution of India.
- c. Enumerate the differences between the Fundamental Rights and the Directive Principles of State Policy.
- d. Describe the election procedure of the President of India.
- e. Mention Five Fundamental Duties mentioned in our Constitution.
- f. Discuss the method of appointment of the Chief Minister of Indian States.
- g. Discuss the position of the Governor of an Indian state.
- h. Critically discuss the Right to Freedom of Religion.

3. Write any four questions: (Within 350 words each) $10 \times 4 = 40$

- a. Discuss Article 19 as enumerated in the Constitution of India and point out its reasonable restrictions.
- b. "The Constitution of India is neither purely federal nor unitary but a combination of both". Do you agree with this view? Give reasons in support of your answer.
- c. Discuss the powers and position of the President of India.
- d. Analyse the relation between the two houses of the Parliament.
- e. Discuss the composition and powers of the Supreme Court of India.

AU/CSE/ B Tech/End Sem/2nd Year/3rd Sem

End Semester Regular and Supplementary Examination 2022-23

Digital Logic (CSEUGPC02)

B Tech , 2nd Year, 3rd Sem

Time : 3.00 Hrs

FM: 80

(Answer 10 marks from Section A, 30 marks from Section B, 40 marks from Section C)

Symbols have their usual meaning. Answer question 1 in one place.

Section A

1. Answer any five Questions (5x2=10)

- ✓ 1. Implement $f = (AB+CD)$ using switches only
- ✓ 2. Complement the function $f = X \cdot (Y'Z' + YZ)$
- ✓ 3. What is Operator Precedence in Boolean Algebra
- ✓ 4. What is relation between Minterm and Maxterms.
- ✓ 5. Represent (-19) in 2's complement form

- ✓ 6. Convert $(52)_8$ to Hexadecimal number
- ✓ 7. Converts Gray [1101] to Binary number
- ✓ 8. Convert $(01010101)_2$ to Decimal number
- ✓ 9. Prove, $A + A'B = A + B$
- ✓ 10. Compare frequency of N-bit Ring and Johnson counter.

Section B

Answer any six Questions (6x5=30)

- ✓ 1. Design a 2:1 Multiplexer circuit
- ✓ 2. Describe a Enabled RS Latch
- ✓ 3. Minimize $(A+BC)(A+B') + A'B'$
- ✓ 4. Find the sum of minterms of $F(A,B,C) = A+B'C$
- ✓ 5. State and prove a D'Morgan Theorem

- ✓ 6. Prove, $(XY + X'Z) = (X + Z)(X' + Y)$
- ✓ 7. Prove, $BC + AC' + AB = BC + AC'$
- ✓ 8. Reduce the function, $A[B+C'(AB+AC')']$
- ✓ 9. Perform addition $(84 + 76)$ in BCD form.
- ✓ 10. Design a Half adder using five NAND Gates only.

Section C

Answer any four Questions (4x10=40)

- ✓ 11. Convert $(41.6875)_{10}$ to binary number, then map to Octal and Hexadecimal number. (6+2+2)
- ✓ 12. Perform addition $(-32) + (40)$ using signed 2's complement method. Now perform the subtraction $(32) - (40)$ using signed 2's complement method. (5+5)
- ✓ 13. $F(A,B,C,D) = \sum_m (0,2,3,5,7,8,9,10,11,13,15)$. Solve the essential prime implicants and the Boolean functions (5+5)
- ✓ 14. $F(A,B,C,D) = \sum_m (0,1,2,5,8,9,10)$. Implement the SOP and POS function using basic gates (5+5)
- ✓ 15. Implement a Full Adder circuit using two 4:1 Multiplexers (10)
- ✓ 16. What is Full Subtractor circuit? Design a Full Subtractor using a 3:8 Decoder Circuit (6+4)
- ✓ 17. Draw a state diagram and state table of a 2 bit up-counter that holds state when input $x=0$, otherwise counts up in sequence. Design the said counter using DFF. (4+4+2)

Aliah University

Odd Semester Examination(Autumn Semester) 2022

(For 2nd Year 3rd Semester B.Tech CSE)

Paper Name: Data Structures & Algorithms
Paper Code: CSEUGPC01

Full Marks:80
Time: 3 hours

Group A

Answer all the questions

(5X2=10)

- ✓ 1. Define Dequeue.
- ✓ 2. Differentiate linear and nonlinear data structure with examples.
- ✓ 3. What is sparse matrix? ,
- ✓ 4. What is threaded binary tree?
- ✓ 5. Define full binary tree and complete binary tree.

Group B

Answer any 5 questions

(5X6=30)

- ✓ 1. Give algorithms to perform following operations in a singly linked list.(3+3)
 - (a) Insert a new node after a given node.
 - (b) Delete last node.
- ✓ 2. Differentiate queue and circular queue. How is queue represented as a linked list?(3+3)
- ✓ 3. Compare and contrast singly linked list and doubly linked list. How will you represent header node in a Linked List?(3+3)
- ✓ 4. What do you understand by complexity of an algorithm? Write worst case and best case complexity of linear search.(3+3) .
- ✓ 5. Let LIST be a singly linked list in memory. Write an algorithm to find number of times a given data item called ITEM occurs in LIST.(6)
- ✓ 6. Differentiate between an array and a stack. Consider a two dimensional array A of order [25X4]. The base address of the array is 400, words per memory cell is 4. Find the address of A[12,4] using row major and column major addressing.(3+3)

Group C

Answer any 4 questions

(4X10=40)

✓ 1. How stack can be represented using a linked list? Give the algorithms for PUSH and POP operations using stack as a linked list. Evaluate the following postfix expression $ABC*D/+$ where $A=2$ $B=3$ $C=4$ $D=6$. (2+6+2)

✓ 2. Define binary search tree. Write an algorithm to search an element from a binary search tree. Suppose that the following list of letters is inserted in order into an empty binary search tree:

J,R,D,G,T,E,M,H,P,A,F,Q

i) Find the final tree T.

ii) Find the pre order, in order and post order traversal of T.

iii) What is the height of the created binary tree? (2+3+5)

✓ 3. Give an algorithm to perform binary search. Using the algorithm, search for elements 23 and 47 in the given set of elements [12 23 27 35 39 42 50]. Compare binary search and linear search. (3+5+2)

✓ 4. Write algorithm for Insertion sort. Discuss the complexity of Insertion sort. Illustrate the insertion sort algorithm on input [30, 20, 10, 60, 70, 40] (4+3+3)

✓ 5. Define collision. What is linear probing? What are the properties of a good hash function? The following keys 10, 16, 11, 1, 3, 4, 23 and 15 are inserted into an initially empty hash table of length 10 using open addressing with hash function $h(k) = k \bmod 10$ and linear probing. What is the resultant hash table? (2+2+2+4)

Aliah University
Odd-Semester (Autumn) Examination - 2022

Paper Name: Discrete Mathematics
Paper Code: MATUGBS04

(For 3rd Semester BTech, CSE)

Full Marks: 80
Time: 3 Hrs

✓ Mention whether statements are True/False – Group - A (10X1=10)

- a) All cyclic graphs are Hamiltonian.
- b) Every Bi-partite graph forms an odd length cycle.
- c) A relation with only diagonal elements is an equivalent relation.
- d) Every map in this world could be colored by a minimum of 4 distinct colors and following the coloring properties.
- e) In a complemented lattice, no vertex can have more than one complement.
- f) A statement is a valid statement when it's always a tautology.
- g) In solving recurrence relation, number of roots we get > order of that equation.
- h) To-sets are distributed lattices.
- i) A trail can have a self-loop in it.
- j) Composition of two relations follows commutative property.

**Group - B
(Answer any 6 questions) (6X5=30)**

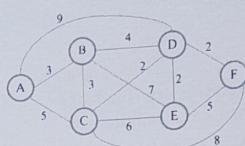
- 1. Write a short note on – Euler graph.
- 2. Define “vertex cover”. Find the cardinality of the minimum vertex cover for Wheel graph of order n (W_n). Mention the main difference between maximal matching and perfect matching.
- 3. Prove that – a graph with no odd length cycle is planar iff it follows the equation $e \leq 2n-4$, where e=size of the graph, n= order of the graph.
- 4. Define relation between two sets. Mention its various types with suitable examples.
- 5. Define join and meet points in a Hasse diagram. What is a lattice? When a lattice is called a “Boolean Lattice”? Explain with examples.
- 6. Consider $A = \{2, 4, 6, 9\}$, and $B = \{1, 2, 3, 4, 5, 6\}$, then determine the values of $A \cup B$, $A - B$, $B - A$ and power set of A.
- 7. In a university there are 2 types of students. Type1 students always tell the truth and Type2 students always lie. A fair coin is given to a random student and is requested to do a toss and asked to keep the result hidden till he/she was asked to tell. Upon asking, he/she replies - “The result of the toss is head if and only if I am telling the truth”. Then conclude whether the result is head/tail.

**Group - C
(Answer any 4 questions) (10X4=40)**

- 8. Define function and its types. Find total number of functions possible from Set A to set B, where $|A|=m$ and $|B|=n$.
- 9. Consider a set $A=\{1,2,3\}$. Calculate number of symmetric relations on set A. A relation on set A is given as $R=\{(1,2), (2,1),(1,1)\}$. Find the Reflexive and Transitive closure of R. [5+5=10]

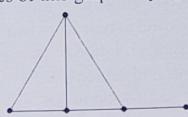
10.

- a) Prove - "In a non-trivial simple graph, there are at-least 2 vertices of the same degree".
b) A connected weighted graph is given below. Find a shortest path between A and F by using Dijkstra's Algorithm. [4+6=10]



11.

- a) Find the chromatic polynomial for the following graph. If 5 colors are available, in how many ways can the vertices of this graph be properly colored?



- b) What is a Binary Search Tree? Insert values given below (in the order) and form the Binary Search Tree (BST) - Values are (in order): 42, 28, 17, 23, 13, 85, 36, 19, 81 Perform deletion of 19 and 42 and then show final BST. [4+6=10]

12.

- a) Define tautology, contradiction and contingency. Give examples. Mention whether the expression: $((p \rightarrow q) \wedge (p \rightarrow r)) \rightarrow (p \rightarrow (q \wedge r))$ is a tautology or not.
b) Explain quantifiers with examples. Suppose there are predicates - Graph(x): x is a graph, Connected(x): x is connected. Write a first order logic statement for - "Not every graph is connected." [5+5=10]
- a) Solve the recurrence relation: $a_n = 4a_{n-1} + 5a_{n-2}$, $a_1 = 2$ and $a_2 = 6$ [5+5=10]
b) Consider the set $D_{30} = \{1, 2, 3, 5, 6, 10, 15, 30\}$ and the relation divides (/) to make a Poset $P = (D_{30}, /)$. Draw the Hasse Diagram for P. Is it a lattice? If yes, then find complements of 3 and 15.

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Autumn Semester Examination - 2022

Btech 4th year, 7th semester Examination

Paper Name: Numerical Methods
Paper Code: MATUGOE01

Full Marks: 80
Time: 3 hrs

Answer any EIGHT (08) questions without attempting extra questions.

1. Why are the numerical interpolation methods used? Differential methods of numerical methods and their applications. How can you derive the errors between Newton forward and backward interpolation methods? Find the optimal polynomial $y=f(x)$ using the given data and compute $y(1.3)$ and $y(1.6)$. Find outcome of

char *getString(){char *str = "Nice test for strings"; return str;}
int main(){printf("%s", getString()); getchar();return 0;}

x	1.4	1.6	1.8	2	2.2
y	0.01	0.21	0.21	0.21	0.45

1+1+2+4+2=10.

2. Define Boole's rule, and Weddle's rule for Numerical integration. Find outcome for int main(){char arr[] = {1, 2, 3}; char *p = arr; printf("%d", sizeof(p)); printf("%d", sizeof(arr)); getchar();}. Solve the following integrals for n=5 intervals:

$$(i) \int_{-1}^1 \frac{1}{(2+\cos(x))} dx \quad (ii) \int_0^9 \frac{1}{(1+e^x)} dx$$

3+1+3+3=10

3. If the equation $y = ae^{bx}$ can be written in linear form $Y=A + BX$, what are Y, X, A, B? Find outcome for void main(){unsigned char c=290; printf("%d",c);}. Find the approximated value of x till 3 iterations for $x^3-4x+9=0$ using the Bisection Method. Find the positive root of the equation $x^3 - 4x - 9 = 0$ using Regula Falsi method and correct to 4 decimal places.

2+4+4=10

4. Use Euler's Method to calculate the approximation of $y(0.2)$ where $y(x)$ is the solution of the initial-value problem that is as follows $y''+xy'+y=0$, $y(0)=2$, $y'(0)=3$. Consider an ordinary differential equation $dy/dx = x^2 + y^2$, $y(1) = 1.2$. Find $y(1.05)$ using the fourth order Runge-Kutta method. Find outcome for int main(){int ok=-100; -100; printf("%d",ok); return 0;} 5+4+1=10

5. Define a system of Linear Equations in four variables. Solve: $3x - y + 14z = 7$; $6x + 2y + 3z = 0$; $x - 18y - 12z = 33$ upto 3 iterations. Describe the importance of Eigenvalues and Eigenvectors of a matrix. Find outcome for int main() {char str[20] = "ABCDEFGHIJK"; int s = strlen(str); str[3] = '\0'; s = strlen(str); printf("%d\n",s); return 0;}

2+4+2+2=10

6. Define Transcendental Equations. Apply Regula-Falsi method to find a root of the equation $x^3 + x - 1 = 0$ correct to two decimal places. Use Newton-Raphson method to find a root of the equation $x^3 - 5x + 3 = 0$ correct to three decimal places. Find the output for void main (){int x = 128; printf ("%n%d", 1 + x++);}

1+4+4+1=10

7. Give the variants of Euler's Method for solution of ODE problem. Use LU Factorization to find the solution of the system of linear equations: $x_1 + x_2 + x_3 = 1$, $3x_1 + x_2 - 3x_3 = 5$ and $x_1 - 2x_2 - 5x_3 = 10$. Suppose that you have the task of measuring the lengths of a bridge and a rivet and come up with 9999 and 9 cm, respectively. If the true values are 10,000 and 10 cm, respectively, compute (a) the true error and (b) the true percent relative error for each case. What is \approx in C? $2+5+2+1=10$

8. Determine the range of integers in base-10 that can be represented on a 16-bit computer. What are the differences between Gauss Jacobi and Gauss Seidel methods? Differentiate between Simpson's $\frac{1}{3}$ rule and Simpson's $\frac{3}{8}$ rule. How can you read the text content of a file using C-programming? $3+2+3+2=10$

9. Write a C Program to Convert Binary Number to Decimal and vice-versa. For the given functions $f(x)$, let $x_0 = 1$, $x_1 = 1.25$, and $x_2 = 1.6$. Construct interpolation polynomials of degree at most one and at most two to approximate $f(1.4)$, and find the absolute error. Construct the Lagrange interpolating polynomials for the function $f(x)$, and find a bound for the absolute error on the interval $[x_0, x_n]$, $f(x) = e^{2x} \cos(3x)$, $x_0 = 0$, $x_1 = 0.3$, $x_2 = 0.6$, $n = 2$. $3+3+4=10$

Aliah University
 Department of Electrical Engineering
 B. Tech. III semester Examination December -2022

Sub: Circuit Theory & Networks

Full Marks: 80

Code- EENUGOE01

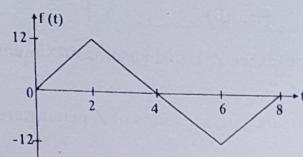
Duration: 3 hrs

- Instructions:**
1. Mention the question number clearly and write all the parts of a question at one place.
 2. Draw circuit/figure wherever applicable.
 3. Make suitable assumptions wherever necessary, symbols and notations have their usual meanings.

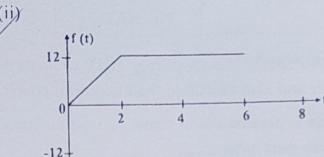
(Answer any Four)

- 1. (A)** Write the expressions for the following signals using basic signals. Show the construction steps graphically for each signal. [8]

(i)



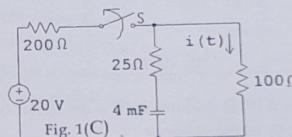
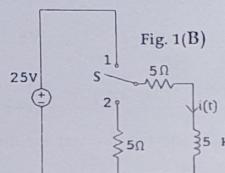
(ii)



- (B)** The circuit in Fig. 1(B) is initially under steady-state condition with switch S at position 1. The switch is moved from position 1 to position 2 at $t = 0$. Find the expression for the current $i(t)$ after switching. [6]

1. The switch is moved from position 1 to position 2 at $t = 0$.

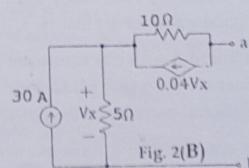
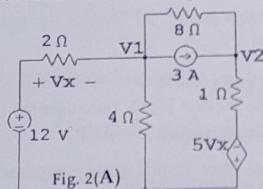
Find the expression for the current $i(t)$ after switching.



- (C)** In the circuit shown in Fig. 1(C), determine the expression for the current 'i(t)' for ' $t > 0$ '. [6]

The switch 'S' has been closed for a long time and is opened at ' $t = 0$ '.

- 2. (A)** Determine the node voltages V_1 and V_2 in the given circuit, Fig. 2(A). [8]



- (B)** For the circuit shown in Fig. 2(B), obtain the Thevenin's equivalent at the terminals a-b. [6]

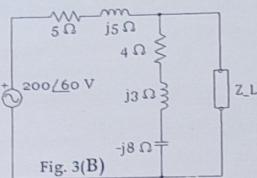
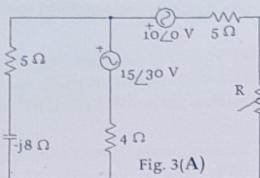
[6]

(C) Given $F(s) = \frac{s(s+1)}{(s+2)(s+3)}$

(a) Use initial and final value theorems to find $f(0)$ and $f(\infty)$, where $f(t) = L^{-1}[F(s)]$.

(b) Verify your answer in part (a) by finding $f(t)$ using partial fraction expansion.

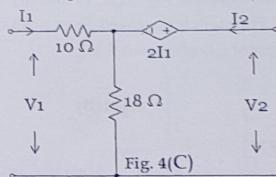
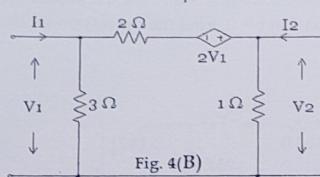
3. (A) In the network shown in Fig. 3(A), determine the variation of current in 'R' when it is varied from 2Ω to 10Ω . [10]



- (B) For the circuit shown in Fig. 3(B), evaluate load impedance Z_L that absorbs maximum power and also calculate the maximum power. [10]

4. (A) Derive h-parameters in terms of T-parameters, and T-parameters in terms of Z-parameters for two-port networks. [6]

- (B) Determine the Z and Y parameters of the network shown in Fig. 4(B). [8]



- (C) Find the ABCD parameters for the given network in Fig. 4(C) and thereby test for the reciprocity of the network. [6]

5. (A) The reduced incidence matrix of an oriented graph is given: [8]

$$\begin{bmatrix} 1 & 6 & 0 & 1 & 1 & 0 & 0 \\ -1 & -1 & 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & -1 & 0 & 1 & 1 \end{bmatrix}$$

- (a) Draw the graph. (b) How many trees are possible for this graph? (c) Deduce the tie-set matrix. (d) Deduce the cut-set matrix.

- (B) An unbalanced 4-wire star connected load has balanced line voltages of 420 V. The load impedances are $Z_A = (8 + j3) \Omega$, $Z_B = (4 - j5) \Omega$ and $Z_C = (10 + j6) \Omega$. Calculate the line currents, neutral current and the power in each phase. Phase sequence is ACB. [8]

- (C) The load connected to a three-phase supply comprises three similar coils connected in delta. The line currents are 21 A and the kVA and kW inputs are 30 and 18, respectively. Find the phase voltages, the kVAR input and the resistance & reactance of each coil. [4]