QP code : 10082556

SE sem III AIDS R-19 C scheme

(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 with proper justifications

Q1	A	State the advantages of linked lists over arrays.	[05]
	B	Create a binary search tree by inserting node values in sequence- 56,32,12,90,-9,78,66,110,44,95.	[05]
	C	Write a program in C to check balanced parentheses using stack.	[05]
	D	Explain double ended queue.	[05]
Q2	A	Write a program to perform following operations on the Singly linked list a) Create the list b) Delete first element c) Insert element at end d) Search an element with value=66 in the list	[10]
	B	Explain the concept of B-tree. Crate a B-tree of order-4 by inserting keys- 5, 3, 21, 9, 13, 22, 7, 10, 11, 14, 8, 16.	[10]
Q3	A	Write a program in C to evaluate a postfix expression.	[10]
	B	Explain the concept of Huffman coding and describe the steps for constructing a Huffman tree. Given the following characters with frequencies, construct the Huffman tree and generate the Huffman codes for the given characters: A:20, B:15, C:5, D:15, E:45	[10]
Q4	A	Construct an AVL tree by inserting the following elements in sequence, showing the tree after each insertion and rotation: 21, 26, 30, 9, 4, 14, 28, 18,10, 7.	[10]
	B	Write a program in C to implement stack ADT using an linked list.	[10]
Q5	A	Explain the different types of linked list with diagram. Also state the advantages of circular and doubly linked list over singly linked list.	[10]
	B	Write a program in C to implement linear queue using array.	[10]
Q6	A	Explain graph representation techniques with suitable example.	[10]
	B	A hash table has 11slots, and the following keys are inserted in this order: 43, 36, 92, 87, 11, 47, 12, 13, 14. Using linear probing as the collision resolution technique, show the final arrangement of keys in the hash table. Use the hash function h(x) = x % 11. Also count number of collisions.	[10]

QP code : 10096788

SE Sem III AIDS R-19 C scheme

Time: 3 hours **Max. Marks: 80**

Instructions:

1) **Question Number 1 is compulsory.**
2) Solve any **three questions** out of **remaining five** questions.
3) Each Question carries 20 marks.
4) Illustrate your answers with neat sketches wherever necessary.
5) Figures to the right indicate full marks.
6) Assume suitable additional data, if necessary and clearly state it.
7) All sub-questions of the same question should be grouped together.

Q.1	**(a)**	What are the advantages and disadvantages of the Von Neumann architecture?	**05**
	(b)	Represent 4.5 in IEEE 754 Single precision Format.	**05**
	(c)	Explain the difference between a MUX and a DMUX with suitable parameters.	**05**
	(d)	Write a microprogram for the instruction ADD R_3, R_4.	**05**
Q.2	**(a)**	A block-set associative cache memory consists of 128 blocks divided into four block sets. The main memory consists of 16,384 blocks and each block contains 256 eight bit words. a) How many bits are required for addressing the main memory? b) How many bits are needed to represent the TAG, SET and WORD fields?	**10**
	(b)	Explain the different methods of Centralized BUS Arbitration.	**10**
Q.3	**(a)**	Compare with suitable parameters a microprogrammed control unit and hardwired control unit.	**10**
	(b)	Explain the various addressing modes.	**10**
Q.4	**(a)**	Explain how the NAND gate can be used as a universal logic gate. Provide examples of how it can be used to implement other logic gates.	**10**
	(b)	Multiply 13 x -6 using Booth's Multiplication Algorithm.	**10**
Q.5	**(a)**	With the help of algorithm for non-restoring division perform the division operation on $(46)_{10}$ and $(23)_{10}$. Show the intermediate steps involved in the division process and explain how the final result is obtained.	**10**

(b) List and describe the typical stages of a classic instruction pipeline in a CPU. What is Pipeline Hazard? Explain the types of pipeline hazards. **10**

Q.6 (a) Draw instruction cycle state diagram with interrupt. **03**

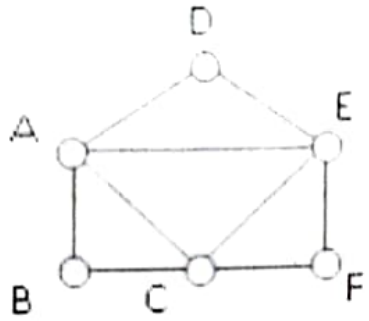
(b) Give the methods used for design of Hardwired Control unit? **03**

(c) What is Cache Memory? A 32-bit computer has a 32 bit memory address. It has 8kB of cache memory. The computer follows four-way set associative mapping. Each line size is 16 bytes. Show the memory address format and cache memory organization. **05**

(d) List the different levels of the memory hierarchy, from the fastest to the slowest. **04**

(e) Draw the block diagram for the MIMD architecture under Flynn's Classification and explain its components. **05**

5 a Define Euler Path, Euler Circuit, Hamiltonian Path and Hamiltonian Circuit. Determine if the following diagram has Euler Path, Euler Circuit, Hamiltonian Path and Hamiltonian Circuit and state the path /circuit. 8



b Consider the Set A={1,2,3,4,5,6} under multiplication Modulo 7. 8
1. Is it a Cyclic group?
2. Find the orders and the Subgroups generated by {2,3}and {3,4}

c Find the complement of each element in D72. 4

6. a Draw the Hasse Diagram of D_{105} and check whether it is a Lattice. 8

b Find the complete solution of the Recurrence relation $a_n + 2a_{n-1} = n+3$ for $n \geq 1$ and $a_0=3$ 8

c Define the following with suitable example. 4
a)Semigroup b) Bipartite Graph c) Distributive Lattice
d) Partial Order Relation

****

QP code : 10095836

SE Sem - III AIDS R-19 C scheme

Time: 3 Hrs **Max. 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.

1. a. Define the following with suitable example 5
a) Power Set b) Monoid c) Bipartite Graph d) Existential Quantifier
b. Find the number of positive integer's n where $1 \leq n \leq 100$ and n is not divisible by 2, 3 or 5. 5
c. Prove that the set A=(0,1,2,3,4,5) is a finite Abelian group under Addition modulo 6 5
d. 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

2 a Define Equivalence Relation. Let A={1,2,3,4,5,6,7,8,9} and define R by aRb if both a and b leave the same remainder when divided by 4. 10
(a) Prove that R is an equivalence relation.
(b) List all equivalence classes. 10

b. Let A={0,1,2,3,4,5}
i) Explain the term group.
ii) Prepare the composition table for the above set w.r.t the operation of addition modulo 6
iii) Determine whether it is a group
iv) Whether elements of set A are invertible? If yes, then find the inverses of these elements.
v) Determine whether it is a cyclic group.

3 a Let f: R→ R be a function defined by f(x)=2x-3. Prove that it is bijective & find inverse. 4

b Let A= {1,2,3,4} and R = { (1,2), (2,3), (3,4), (2,1) } Find the Transitive Closure of R by using Warshall's algorithm 8

c For the set A= {2,3,6,12,24,36}, a relation R defined by divisibility Answer the following 8
a) Draw the Hasse Diagram
b) What are the maximal and Minimal elements
c) Is the poset Lattice?
Give one example of chain and antichain

4 a If $f: R \rightarrow R$ and g: $R \rightarrow R$ are defined by $f(x) = x+2$ and $g(x) = x^2$ 8
find (i) f o g o f (ii) g o f o g

b Consider (3,6) encoding function given below is a group code 8
e(000) = 000000, e(001) = 000110, e(010) = 010010, e(011) = 010100
e(011) = 010100 e(100) = 100101 e(101) = 100011 e(110) = 110111,
e(111) = 110001.

c Prove by mathematical induction that 4
$1+5+9+\ldots\ldots+(4n-3) = n(2n-1)$

Q4 A The first 3 moments of a distribution about 2 of the random variable X are 1, 22 and 10. Compute Mean, variance and third central moment μ_3 **6**

B Consider the equations of regression lines 4x-5y= -33 and 20x-9y - 107=0. Find $\bar{x}$, $\bar{y}$ and correlation coefficient r. **6**

C Find $L^{-1}\{\frac{(s+3)^2}{(s^2+6s+5)^2}\}$ **8**

Q5 A Show that the Laplace transform of $\frac{sin2t+sin3t}{t} = \pi - tan^{-1}(\frac{5s}{6-s^2})$. **6**

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

X :	85	74	85	50	65	78	74	60	74	90
Y :	78	91	78	58	60	72	80	55	68	70

C Obtain Fourier Series for f(x) = $\begin{cases} cosx, & -\pi < x < 0 \\ sinx, & 0 < x < \pi \end{cases}$ **8**

Q6 A If f(x) is probability density function of a continuous random variable X. find mean and variance. **6**

$f(x) = 6(x-x^2)$, $0<x<1$

B Check if there exists an analytic function whose real part is $u= e^x(xcos2y-ysin2y)$. If so, find f(z). Justify your answer. **6**

C Evaluate the following integral by using Laplace transforms **8**

$\int_0^\infty e^{-t}\,[\int_0^t u^2 sinhu\ coshu\ du]\,dt$

****

SE Sem III AIDS R-19 CScheme

QP code: 10094865

Duration: 3 hours **Max. Marks: 80**

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 $f(t) = (cos2t + sint)^2$, find L[f(t)] and hence find $L\{e^{-2t}f(t)\}$ **5**

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

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

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

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

Q2 A Find the orthogonal trajectories of the family of curves $3x^2y-y^3 = c$ **6**

B Find $L\{t(\frac{cos2t}{e^t})^2\}$ **6**

C Find the Fourier series expansion for f(x) = 1, $0 < x < 1$.
=x, $1 < x < 2$ **8**

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

Q3 A Find $L^{-1}\{log(\frac{s^2+9}{\sqrt{s+8}})\}$ **6**

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

C Fit a parabola $y = a + bx + cx^2$ for the following data: **8**

X :	1	2	3	4	5	6	7	8	9
Y :	2	6	7	8	10	11	11	10	9

OR

c.	Analyse the advantages and disadvantages of centralized and distributed bus arbitration methods.	5	2M

Q.6	Answer the following		
a.	List the three operating modes of the Intel 80386DX processor.	6	7M
b.	Design a flowchart or diagram explaining how pipeline hazards are detected and resolved in modern CPU pipeline.	6	6M

OR

C.	State Amdahl's Law and explain its significance in parallel processing.	6	6M

JNIESTRT

SMT. INDIRA GANDHI COLLEGE OF ENGINEERING

An Autonomous Institute with NAAC 'A' Grade
Approved by AICTE, Affiliated to the University of Mumbai.

END SEMESTER EXAMINATION (SIGCE NEP 2020)

QP Code: 2132141

Subject Name: Computer Organisation and Architecture
Subject Code: 2483114 Branch: AI &DS
Duration: 2.5Hrs

Date: 07/11/2025
Sem: III
Max Marks: 60

Note:

1) Attempt all questions
2) Assume suitable data wherever necessary.
3) Figures to the right indicate full marks

		CO	Marks
Q.1	Answer the following (Any two)		
a.	Describe the working and logic symbols of basic logic gates: AND, OR. Draw their truth tables and explain their importance in digital circuits.	1	3M
b.	Convert the binary number 110101101 to hexadecimal.	1	3M
c.	Evaluate hexadecimal 1A3 to octal.	1	3M
Q.2	Answer the following		
a.	Explain Booth's algorithm for binary multiplication. Illustrate the steps of Booth's algorithm with a suitable example.	2	8M
b.	Draw the flow chart for non-restoring algorithm and perform 6/2	2	5M
	OR		
c.	What is the difference between Computer Organisation and Computer Architecture explain in detail	2	5M
Q.3	Answer the following		
a.	Discuss about Instruction Cycle with an example	3	6M
b.	Compare CISC and RISC Processors with an example	3	5M
	OR		
c.	Differentiate micro-programmed and hardwired control unit design approaches in a processor.	3	5M
Q.4	Answer the following		
a.	Demonstrate about virtual memory? Explain segmentation and paging techniques used in virtual memory management.	4	7M
b.	Interpret cache coherence	4	4M
	OR		
c.	Justify interleaved memory	4	4M
Q.5	Answer the following		
a.	Distinguish the roles and characteristics of the address bus, data bus, and control bus.	5	4M
b	Elaborate about Memory Management	5	2M

SMT. INDIRA GANDHI COLLEGE OF ENGINEERING

An Autonomous Institute with NAAC 'A' Grade

Approved by AICTE, Affiliated to the University of Mumbai

a.	Explain digital wallets? Describe the types of digital wallet and features?	2	10
b.	Explain security and precautions of against ponzi schemes?	1	5
	OR		
c.	Explain unified payments interface (UPI) and Net banking?	2	5

JNIESTRT

SMT. INDIRA GANDHI COLLEGE OF ENGINEERING

An Autonomous Institute with NAAC 'A' Grade

Approved by AICTE, Affiliated to the University of Mumbai.

END SEMESTER EXAMINATION (SIGCE NEP 2020)

QPCode: 2132151

Subject Name: Financial literacy

Subject Code:2483311

Branch: AI&DS

Duration:2.30 hrs

Date: 10/11/2025

Sem: III

Max Marks: 60

Note:

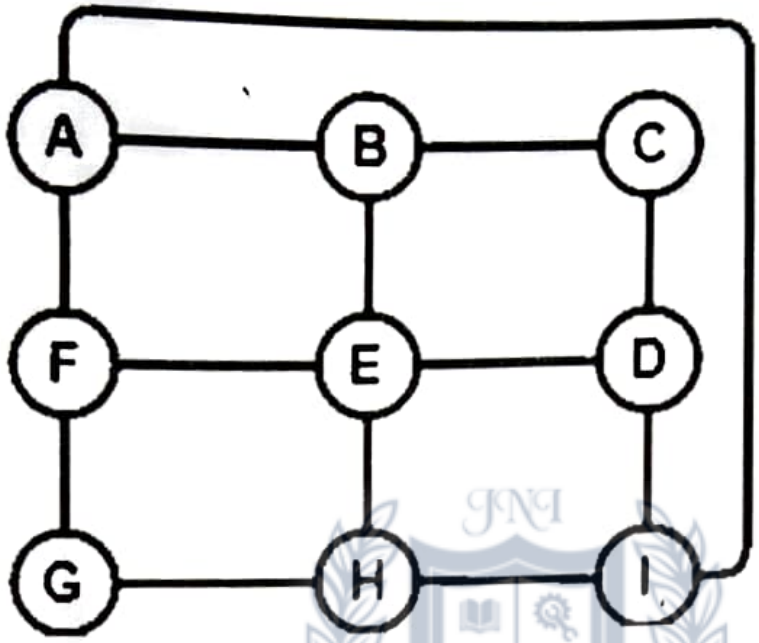
1) Attempt all questions
2) Assume suitable data wherever necessary.
3) Figures to the right indicate full marks

		CO	Mark
Q.1	Answer the following		10
a.	Explain strategies to build lasting financial discipline?	1	5
b.	Explain advanced budget frameworks in rolling forecasts, 50/30/20rule with along key features And pros and cons?	2	5
	OR		
c.	What are the financial products? How products leverage opportunities?	2	5
Q.2	Answer the following		10
a.	What are popular investment opportunities and also write their financial products?	3	5
b.	Explain the core principles of financial planning?	1	5
	OR		
c.	c. What is an insurance planning?	3	5

Solve either Q.3 or Q.4

Q.3	Answer the following		15
a.	Explain the tools and techniques for effective planning?	2	8
b.	What are the major medical insurance schemes in India?	1	7
	OR		
Q.4	Answer the following		15
a.	Describe the life insurance products in comparative dashboards?	3	8
b.	Describe the slide deck template? (Any seven)	3	7
Q.5	Answer the following		
a.	Illustrate with an example how a salaried individual can plane their taxes efficiently using Deductions, exemptions, and rebates?	2	10
	OR		
b	Explain the different types of life insurance policies available in India?	1	10
Q.6	Answer the following		15

d. What are the sufficient conditions for Hamiltonian circuit to exist in a graph? Find the Hamiltonian path and circuit in the following graph, if it exists: 6 04



SMT. INDIRA GANDHI COLLEGE OF ENGINEERING

An Autonomous Institute with NAAC 'A' Grade
Approved by AICTE, Affiliated to the University of Mumbai.

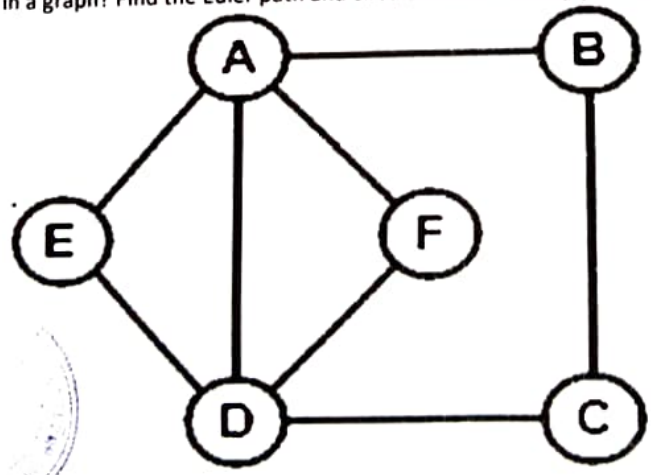
			4	08
Q.4	**Q.4 a) is compulsory, solve any one from the remaining.**		4	05
a.	Solve the recurrence relation $a_n=7a_{n-1}-10a_{n-2}$ with $a_0=2$ and $a_1=3$.		4	03
b.	A survey of 500 television watchers produced the following information:285 watch football games,195 watch hockey games, 45 watch football and basketball games, 70 watch football ar hockey games, 50 watch hockey and basketball, 50 do not watch any of the three kinds of gam watch all three games. How many watchers watch exactly two games?		4	03
c.	What is the minimum number of students required in a discrete mathematics class to be sure least six will receive the same grade, if there are five possible grades, A, B, C, D and F			
			5	12
Q.5	**Q.5 a) is compulsory, solve any one from the remaining.**		5	08
a.	(i)	What is an Abelian group? Let G={1,2,3,4,5,6,7}		
	(ii)	Prepare the composition table w.r.t. the operation of multiplication modulo 8		
	(iii)	Check whether it is an Abelian group. Justify your answer.	5	04
b.	Define normal subgroup with the help of a detailed example		5	04
c.	Define semigroup with the help of a detailed example			
			6	12
Q.6	**Answer the following (any Three)**		6	04

a. Given two graphs G_1 and G_2 with adjacency matrices

$$A(G_1)=\begin{bmatrix}0&1&0&1\\1&0&1&0\\0&1&0&1\\1&0&1&0\end{bmatrix}, A(G_2)=\begin{bmatrix}0&1&1&0\\1&0&0&1\\1&0&0&1\\0&1&1&0\end{bmatrix}$$

1. Determine whether G_1 and G_2 are isomorphic.
2. If yes, specify the vertex mapping.
3. If not, explain clearly which graph property (degree sequence, adjacency pattern, conn components, etc.) fails to match.

b.	Check whether the graph $K_{3,3}$ is planar.	6	04
c.	What are the necessary and sufficient conditions for Euler path, Euler circuit to exist in a graph? Find the Euler path and circuit in the following graph, if it exists:	6	04



SMT. INDIRA GANDHI COLLEGE OF ENGINEERING

An Autonomous Institute with NAAC 'A' Grade
Approved by AICTE, Affiliated to the University of Mumbai.

END SEMESTER EXAMINATION (SIGCE NEP 2020)

QP Code: 2132123

Date: 31/10/2025

Subject Name: Discrete Structures and Graph Theory
Subject Code: 2483112 Branch: AI & DS
Duration: 2.5 Hrs
Sem: III
Max Marks: 60

Note:

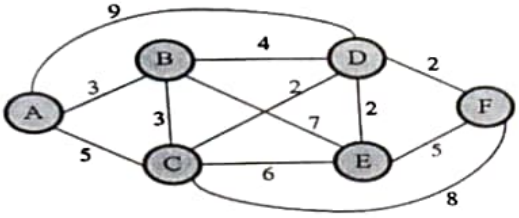
1) Attempt all questions
2) Assume suitable data wherever necessary.
3) Figures to the right indicate full marks

		CO	Marks
Q.1	**Answer the following (Any Three)**	**1**	**12**
a.	Show that the sum of the squares of the first n natural numbers is n(n+1)(2n+1)/6, by mathem induction.	1	04
b.	Consider: A={1,2,3,4,5,6,7,8,9,10}, B={x|x∈N, x is even and <=10} C={x|x∈N, x is a multiple of 3 and <=9} Compute: 1. (B∪C)' 2. Verify whether (B∪C)'=B'∩C'	1	04
c.	Let P(x): x is even; Q(x): x is a prime number; and R(x, y): x + y is even. The variables x and y represent integers. Determine the truth value of each of the following statements: (1) ∀x ∃y R(x, y) (2) ∃x ∀y R(x, y)	1	04
d.	Construct truth tables to determine whether the following statement is a tautology, a conting or a contradiction: $(q \wedge (\sim p)) \leftrightarrow r$	1	04
Q.2	**Answer the following (any Two)**	**2**	**12**
a.	Let A= {1,2,3,4,5,6} and R= {(a, b) | a + b is even}. Determine whether R is reflexive, symmetric, transitive.	2	06
b.	Let A ={1,2,3,4,6} =B , aRb if and only if a is multiple of b. i. Write R as a set. ii. Draw the digraph representing R. iii. Write the adjacency matrix representing R iv. Find Domain and Range of R.	2	06
c.	Draw a stepwise Hasse diagram of D_{42} under the divisibility relation.	2	06
Q.3	**Answer the following (any One)**	**3**	**04**
a.	Consider A=B=C=R and let f: A -> B and g: B->C be defined by f(x)=x+9 and $g(y)=y^2+3$. Find: i) g o f(3) ii) f o g(-3)	3	04
b.	Function f(x): (4x+3) / (5x-2). Find f^{-1}	3	04

SMT. INDIRA GANDHI COLLEGE OF ENGINEERING

An Autonomous Institute with NAAC 'A' Grade
Approved by AICTE, Affiliated to the University of Mumbai.

c. Find the shortest path from source vertex A using Dijkstra's algorithm. 3 5



Q.4 Answer the following (any TWO).

a. Consider the following weighted adjacency matrix. Draw the graph and apply dynamic Programming to find the optimal travelling salesman tour. Assume that the starting vertex is 1. Also discuss time complexity of Travelling salesman problem for dynamic programming approach. 4 8

	1	2	3	4
1	0	10	15	20
2	5	0	9	10
3	6	13	0	12
4	8	8	9	0

b. Given two sequences of characters. A="CANADA" and B="KANNADA", Obtain the Longest Common Subsequence using dynamic approach. 4 8

c. Explain Multistage graph with example 4 8

Q.5 Answer the following (Q5 a is compulsory. Attempt any one from b & c.)

a. Explain sum of subset problem, Find all possible subsets of weight that sum to m, let n =6, m = 30, and w[1:6] = {5, 10, 12, 13, 15, 18) 5 7

b. Explain 15-puzzle problem. 5 3

c. Explain Graph colouring. 5 3

Q.6 Answer the following (any TWO)

a. Explain Rabin karp algorithm 6 3

b. Write and explain string matching with finite automata with an example. 6 3

c. To implement the knuth - Morris-Pratt, string matching algorithm. 6 3

JNIESTRT

SMT. INDIRA GANDHI COLLEGE OF ENGINEERING

An Autonomous Institute with NAAC 'A' Grade
Approved by AICTE, Affiliated to the University of Mumbai.

END SEMESTER EXAMINATION (SIGCE NEP 2020)

QP Code:2132133

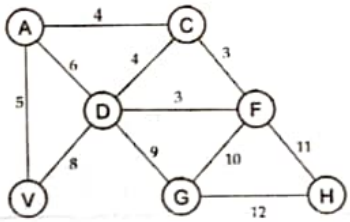
Date: 26/12/25

Subject Name: Analysis of Algorithms
Subject Code: 2483113 Branch: AI & DS
Duration: 2.30 Hrs.
Sem: III
Max Marks: 60

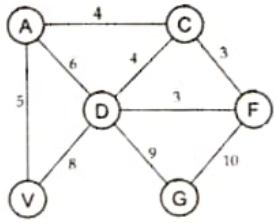
Note:

1) Attempt all questions
2) Assume suitable data wherever necessary.
3) Figures to the right indicate full marks

		CO	Marks
Q.1	**Answer the following (Q1 a is compulsory. Attempt any one from b & c.)**		
a.	Perform Insertion Sort on the given set of numbers and show the result after each pass. <11, 7, 17, 3, 9, 29, 85, 17>	1	6
b.	To find the complexity of given recurrence relation. $T(n) = 4T(n/2) + n^2$	1	3
c.	Explain Theta notation.	1	3
Q.2	**Answer the following (Q2 a is compulsory. Attempt any one from b & c.)**		
a.	Sort the following numbers using Merge Sort. Also, derive the time complexity of Merge Sort. <38, 27, 43, 3, 9, 82, 10, 55, 18>	2	6
b.	Implement the binary search and derive its complexity.	2	3
c.	Compare the Merge and Quick sort.	2	3
Q.3	**Answer the following (any TWO).**		
a.	Find Minimum Spanning tree of the following Graph using Prim's Algorithm.	3	5



b.	Find Minimum Spanning tree of the following Graph using Kruskal Algorithm.	3	5



SMT. INDIRA GANDHI COLLEGE OF ENGINEERING

An Autonomous Institute with NAAC 'A' Grade
Approved by AICTE. Affiliated to the University of Mumbai.

Q.4 Answer the following **(any two)** 4 **10**

a. Find Fourier series expansion of 05

$$f(x) = x \qquad 0 < x \leq \pi$$
$$= 2\pi - x \qquad \pi \leq x < 2\pi$$

b. Find the Fourier expansion of $f(x) = x^2$ in $(-1, +1)$ and hence deduce that 05

$$\frac{\pi^2}{6} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \cdots\cdots$$

c. Find Fourier expansion of $f(x) = x$ in $(-\pi, +\pi)$ and hence deduce that 05

$$\frac{\pi}{4} = \frac{1}{1} - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \cdots\cdots$$

Q.5 Answer the following **(any two)** 5 **10**

a. Calculate Karl Pearson's correlation coefficient for the following bivariate data 05

X	2	4	6	8	10
Y	5	7	9	11	13

b. Calculate Spearman's rank correlation coefficient for the following bivariate data 05

X	75	85	75	65	65	55
Y	85	85	80	70	70	60

c. Fit a straight line to the following bivariate data 05

x	1	2	3	4	5	6
y	2	3	5	4	6	7

Q.6 Answer the following **(any two)** 6 **10**

a. A continuous random variable X has p.d.f. 05

$$f(x) = 2e^{-2x} \qquad x > 0$$
$$= 0 \qquad x \leq 0$$

Find m.g.f and hence find it's mean & standard deviation.

b. A manufacturer of electric bulbs sells out 500 lots each consisting of100 bulbs. If 5% bulbs are defective. In how many lots can we expect i) 97 or more good bulbs. I) less than 97 good bulbs 05

c. The life of army shoes is normally distributed with mean 8 months and standard deviation 2 months. If 5000 pairs are issued, how many pairs would be expected to need replacement after 12 months? 05

SMT. INDIRA GANDHI COLLEGE OF ENGINEERING

An Autonomous Institute with NAAC 'A' Grade
Approved by AICTE, Affiliated to the University of Mumbai.

END SEMESTER EXAMINATION (SIGCE NEP 2020)

QPCode:2132111

Date: 29/10/2025

Subject Name: Mathematics for Computer Engineering
Subject Code: 2483111 Branch: AIDS
Duration: 02:30 Hours

Sem: III
Max Marks: 60

Note:

1) Attempt all questions.
2) Statistical table will be provided.
3) Figures to the right indicate full marks.

		CO	Marks
		1	**10**
Q.1	Answer the following **(any two)**		05
a.	State Cayley Hamilton theorem and verify it for $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, Also find its inverse.		05
b.	Show that the matrix $A = \begin{bmatrix} 4 & 1 \\ 0 & 2 \end{bmatrix}$ is diagonalisable and hence find diagonal matrix D & transforming matrix P.		05
c.	Find the eigen values of $A + A^2 + adj(A) + A^{-1}$ if $A = \begin{bmatrix} 1 & 3 & 4 \\ 0 & -1 & 2 \\ 0 & 0 & -1 \end{bmatrix}$		
		2	**10**
Q.2	Answer the following **(any two)**		05
a.	Find all possible basic solutions to following LPP and classify them in feasible, degenerate & optimal solution $Minimise\ z = x_1 + 2x_2 + 3x_3$ $Subject\ to\ \ x_1 + x_2 + x_3 = 6$ $2x_1 + x_2 + 3x_3 = 10$		05
b.	Solve following LPP by Simplex method $Maximise\ z = 6x_1 + 5x_2$ $Subject\ to\ x_1 + x_2 \leq 5$ $3x_1 + 2x_2 \leq 12$ $x_1, x_2 \geq 0$		05
c.	Solve following NLPP by Lagrange's multiplier method $Optimise\ z = 12x_1 + 8x_2 + 6x_3 - {x_1}^2 - {x_2}^2 - {x_3}^2 - 23$ $subject\ to\ x_1 + x_2 + x_3 = 10$ $x_1, x_2, x_3 \geq 0$		
		3	**10**
Q.3	Answer the following **(any two)**		05
a.	State Chinese-Remainder theorem and hence solve $x \equiv 2(mod3)$ $x \equiv 3(mod4)$ $x \equiv 2(mod5)$		
b.	State Euler's theorem and hence prove that $9^{121} \equiv 9(mod40)$		05
c.	State Fermat's little theorem and hence prove that $5^{2003} \equiv 5(mod23)$		05

P.T.O