QPCode:2232113

END SEMESTER EXAMINATION (SIGCE NEP 2020)

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

Date:
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
Q.1	Answer the following (**any two**)	1	**10**
a.	State Cayley Hamilton theorem and verify it for $A = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$, 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 $A = \begin{bmatrix} -1 & 2 & 3 \\ 0 & 1 & 4 \\ 0 & 0 & -1 \end{bmatrix}$		05
Q.2	Answer the following (**any two**)	2	**10**
a.	Find all possible basic solutions to following LPP and classify them in feasible, degenerate & optimal solution $Maximise\ z = 3x_1 + 2x_2 + x_3$ $Subject\ to\ \ x_1 + x_2 + x_3 = 5$ $2x_1 + 3x_2 + x_3 = 9$		05
b.	Solve following LPP by Simplex method. $Maximise\ z = 3x_1 + 2x_2$ $Subject\ to\ \ x_1 + x_2 \leq 4$ $2x_1 + x_2 \leq 5$ $x_1, x_2 \geq 0$		05
c.	Solve following NLPP by Lagrange's multiplier method. $Optimise\ z = -24x_1 - 8x_2 - 12x_3 + 2{x_1}^2 + 2{x_2}^2 + 2{x_3}^2 + 260$ $subject\ to\ \ x_1 + x_2 + x_3 = 11$ $x_1, x_2, x_3 \geq 0$		05
Q.3	Answer the following (**any two**)	3	**10**
a.	State Chinese-Remainder theorem and hence solve $x \equiv 2(mod3)$ $x \equiv 3(mod4)$ $x \equiv 1(mod5)$		05
b.	State Euler's theorem and hence prove that $7^{337} \equiv 7(mod50)$		05
c.	State Fermat's little theorem and hence prove that $6^{2017} \equiv 6(mod17)$		05

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

a. Find the Fourier series expansion of $f(x) = x + x^2$ in $(-1, +1)$ 05

b. Find the Fourier series expansion of 05

$$f(x) = \frac{\pi}{2} + x \qquad -\pi < x < 0$$
$$= \frac{\pi}{2} - x \qquad 0 < x < \pi$$

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

c. Find the Fourier expansion of $f(x) = \frac{x(\pi^2 - x^2)}{12}$ in $(-\pi, +\pi)$ and hence deduce that 05

$\frac{\pi^3}{32} = \frac{1}{1^3} - \frac{1}{3^3} + \frac{1}{5^3} - \frac{1}{7^3} + \cdots\cdots$

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

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

X	1	2	3	4	5
Y	2	4	5	4	5

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

X	88	92	88	85	85	80
Y	75	75	80	70	70	65

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

X	0	1	2	3	4	5
y	1	1	2	2	3	3

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

a. If X denotes the outcome when a fair dice is tossed, find m.g.f of X and hence find mean & standard deviation of X. 05

b. A manufacturer of certain articles knows that on an average 5% of the articles are defective. He sells them in boxes of 100 and guarantees that no more than 4 articles are defective. In how many boxes out of 1000 he will meet the guaranteed quality? 05

c. For a normal distribution 30% items are below 45 & 8% items are above 64. Find mean and standard deviation? 05

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END SEMESTER EXAMINATION (SIGCE NEP 2020)

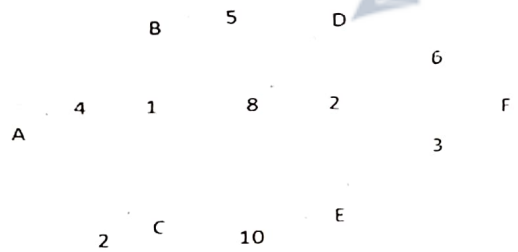
QP Code: 2232132

Date: 26/12/2025

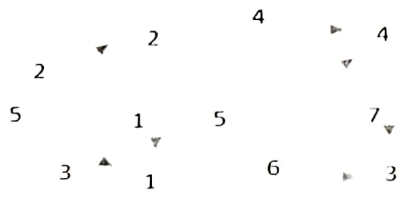
Subject Name: Analysis of Algorithm
Subject Code: 2163113 Branch: CSE-AIML
Duration:2.5 Hrs
Sem: III
Max Marks: 60

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 two)**	**CO1**	**08**
a.	Compare time and space complexity of Selection Sort and Insertion Sort.		4
b.	Write the Insertion Sort algorithm and show its working for the array [9, 5, 1, 4, 3].		4
c.	Write the Selection Sort algorithm and perform its iteration trace for the input: [9, 2, 6, 3, 10] .		4
Q.2	**Answer the following (any one)**	**CO2**	**08**
a.	Trace Quick Sort on [7, 2, 1, 6, 8, 5, 3, 4] considering the first element as pivot.		8
b.	Use Binary Search to find 23 in [2, 5, 8, 12, 16, 23, 38, 56]. Show all intermediate steps.		8
Q.3	**Answer the following (any two)**	**CO3**	**08**
a.	Apply Dijkstra's Algorithm to find the shortest path from source vertex A for the given weighted graph.		4



b.	Apply Prim's Algorithm on the following graph and show the step-by-step formation of the MST: Vertices: A, B, C, D, E Edges with weights:		4



c.	State the difference between Kruskal's and Prim's algorithms.		4

Q.4 Answer the following (Any two) **CO4** **16**

a. Using Dynamic Programming, solve the Travelling Salesperson Problem (TSP) for 4 cities with the given cost matrix. Derive the minimum cost tour and show intermediate steps. 08

Example Cost Matrix.

$$\begin{bmatrix} 0 & 5 & 9 & 10 \\ 5 & 0 & 6 & 4 \\ 9 & 6 & 0 & 8 \\ 10 & 4 & 8 & 0 \end{bmatrix}$$

b. Solve the Longest Common Subsequence (LCS) problem step by step. 08
X = "BACDBAC"
Y = "BDCBACD"

c. Solve the 0/1 Knapsack Problem using Dynamic Programming for the following instance: 08
Items = {1, 2, 3, 4}, Weights = {2, 3, 4, 5}, Profits = {3, 4, 5, 6}, Capacity = 5. Show the complete DP table and derive the optimal solution.

Q.5 Answer the following (any three) **CO5** **12**

a. Using backtracking, find all subsets of the set {2, 3, 5, 6, 8} whose sum is 8. Explain the process using a state-space tree. 04

b. Solve the following initial state of 8-puzzle (simplified 15-puzzle) using Branch and Bound with the number of misplaced tiles heuristic: 04

Initial State:

1	2	3
4	5	6
	7	8

Goal State:

1	2	3
4	5	6
7	8	

c. Discuss real-life applications of Backtracking and Branch & Bound algorithm. 04

d. Using backtracking, colour the following graph with 3 colours so that no two adjacent vertices have the same colour. 04

Q.6 Answer the following (any two) **CO6** **08**

a. How many character comparisons are required to find pattern "ABC" in text "ABABABC" using the Naïve algorithm? Show step by step. 04

b. What is the main advantage of the Rabin-Karp algorithm over the Naïve algorithm? 04

c. Explain how KMP avoids unnecessary comparisons with an example using text T = "ABABABC" and pattern P = "ABABC". 04

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END SEMESTER EXAMINATION (SIGCE NEP 2020)

QP Code:2233121

Subject Name: Discrete Structures and Graph Theory

Date: 31/10/2025

Subject Code: 2163112 Branch:CSE-AIML

Sem: III

Duration:2.5Hrs

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)**	**CO1**	**10**
a.	Using Mathematical Induction ,Prove that $1 + 4 + 7 \ldots\ldots + (3n - 2) = n(3n - 1)/2$.		5
b.	Write the converse, inverse and contra-positive of the conditional. "If two integers are equal then their squares are equal".		5
c.	Define Quantifiers and types of Quantifiers with examples.		5
Q.2	**Answer the following (any two)**	**CO2**	**10**
a.	Find the greatest lower bound and least upper bound of the set {3 , 9, 12} and {1 , 2, 4 , 5, 10} If they exist in the poset (z+, /). Where / is the relation of divisibility.		5
b.	Find the complement of each element in D42.		5
c.	Explain the equivalence relation and its type with examples.		5
Q.3	**Answer the following (any two)**	**CO3**	**8**
a.	Explain function and its types with neat diagrams.		4
b.	Find the inverse of the function f(x)=3x+5.		4
c.	Let f(x) = x + 2, g(x) = x - 2, and h(x) = 3x for x €R, where R = set of real numbers. Find (f o h) , (h o g) , (h o f) , (f o h o g).		
Q.4	**Answer the following (any two)**	**CO4**	**8**
a.	Solve $a_n = a_{n-1} + 2a_{n-2}$, $n > 2$ with condition the initial $a_0 = 0$, $a_1 = 1$		4
b.	Out of 150 attendees at an event:80 attended Workshop A,70 attended Workshop B and 40 attended both Workshop A and Workshop B.How many people attended at least one workshop?		4

c. Show that 7 colours are used to paint 50bicycles at least 8 bicycles will be of the same colour. 4

Q.5 Answer the following (any two) **CO5 12**

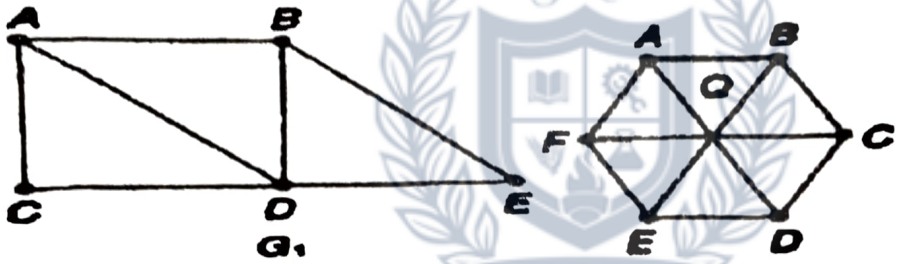
a. Prove that set G = {1,2,3,4,5,6} is a finite abelian group of order 6 with respect to multiplication module 7. 6

b. Explain the algebraic structures with one binary operation with an example. 6

c. Show that G = {1, w, w2 } is an abelian group under multiplication. Where 1, w, w2 are cube root. 6

Q.6 Answer the following (any two) **CO6 12**

a. Determine if there is an Euler path , Euler circuit if it does not exist .Justify. in the following Diagrams. 6



b. Define Walk, Trail, Path, and Circuit. Give one example for each. 6

c. Explain real life applications of Graph Theory. 6

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END SEMESTER EXAMINATION (SIGCE NEP 2020)

QP Code: 2232153

Date: 10/10/2025

Subject Name: Disaster Management
Subject Code: 2163311 Branch: CSE-AIML
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 two)**	1	8
a.	Define "Disaster" and discuss various types of natural and man-made disasters.		4
b.	Define a tropical cyclone. Explain the conditions necessary for its formation		4
c.	Write short notes on India's seismic and flood-prone regions.		4
Q.2	**Answer the following (any two)**	1	8
a.	Briefly discuss the role of IMD (India Meteorological Department) in cyclone forecasting and early warning.		4
b.	Explain how deforestation and unplanned construction increase landslide risks in India		4
c.	Discuss how plate collision in the Himalayan belt contributes to seismic vulnerability in Northern India.		4
Q.3	**Answer the following (any two)**	2	8
a.	Explain how disaster management integrates preparedness, mitigation, and response to minimize losses.		4
b.	Differentiate between preparedness and mitigation.		4
c.	Discuss the roles of supporting agencies such as NDRF, NIDM, IMD in DM.		4
Q.4	**Answer the following (any two)**	2	6
a.	Define disaster management and mention its key components.		3
b.	Describe the role of local self-government institutions (Municipalities, Panchayats) in the institutional framework for DM		3
c.	What is the main objective of forming NDMA?		3
Q.5	**Answer the following (any three)**	3	15
a.	Describe the process of early warning system development and dissemination. Why is timely communication critical in disaster preparedness?		5
b.	How can GIS and remote sensing technologies support disaster risk mapping and planning		5
c.	Discuss the significance of psychosocial support and community rehabilitation after a major disaster.		5
d.	How do policy frameworks and institutional mechanisms ensure effective post-disaster		5

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Q.6	**Answer the following (any three)**	**4**	**15**
a.	"Education is the most important tool for DRR (Disaster Risk Reduction)." Discuss.		5
b.	Analyse how NGOs & media mobilize community participation		5
c.	Evaluate GIS in emergency response & evacuation planning		5
d.	Explain the role of UNESCO and India's School Safety Programme.		5

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END SEMESTER EXAMINATION (SIGCE NEP 2020)

QP Code: 2232141

Subject Name: Computer Organization& Architecture

Date: 07/11/2025

Subject Code:2483114 Branch:CSE-AIML

Sem: III

Duration: 2hr30 Min

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)**	**CO2**	**15**
a.	Solve 5 x 3 multiplication using Booths Algorithm.		5
b.	Perform Addition of 1) 654 and 542 octal numbers. 2) 24CD and 12AC hexadecimal numbe		5
c.	Draw Flowchart of Booths Algorithm Non-Restoring division technique and divide 8 by 2 using thesame.		5
d.	Convert (126.25)decimal floating point number in IEEE 754 single precision format.		5
Q.2	**Answer the following (any one)**	**CO1**	**5**
a.	Convert the decimal number 125.2 to binary and Find 2's complement of 10101010.		5
b.	Write short note on Logic Gates.		5
Q.3	**Answer the following (any three)**	**CO3**	**15**
a.	Draw and Explain Architecture of 8086 processor.		5
b.	Explain any one method of a hardwired control unit.		5
c.	Explain the concept of microprogramming and its role in instruction execution.		5
d.	Write short note on RISC and CISCarchitectures.		5
Q.4	**Answer the following (any one)**	**CO4**	**10**
a.	Write short on Catch mapping techniques.		10
b.	Discuss Memory hierarchy and characteristics of memory in detail.		10
Q.5	**Answer the following (any one)**	**CO5**	**5**
a.	Write short note on bus arbitration.		5
b.	Explain Types of Buses and Bus standards in detail.		5
Q.6	**Answer the following (any one)**	**CO6**	**10**
a.	Explain Flynn's classification in detail with diagrams.		10
b.	Explain operating modes of 80386 processor.		10

Qp code : 10095544

SE Sem III CSE (AIML) R-19 Cscheme

Time: 3 Hours **Total Marks 80**

N.B: 1) Question **number 1** is compulsory.
2) Attempt **any three** out of the remaining.
3) Assume suitable data if **necessary** and justify the assumptions.
4) Figures to the **right** indicate full marks.

1		Attempt any **FOUR.**	
	a)	What is rasterization? Explain with neat diagram	[05]
	b)	Describe what is Homogeneous coordinates	[05]
	c)	Give properties of Bezier Curve.	[05]
	d)	Derive initial value for mid-point ellipse	[05]
	e)	Define Aliasing, what is anti-aliasing? Give different antialiasing techniques	[05]
2	a)	Given a line AB where A(0,0) and B(5,2) calculate all the points on the line using BRESENHAM line algorithm	[10]
	b)	Derive formulas for Mid-point Circle algorithm	[10]
3	a)	What is Composite transformation? Derive a composite matrix for rotation at fix point P.	[10]
	b)	Explain shear transformation. Given a rectangle ABCD where A(0,0), B(0,10), C(10,10) and D(10,0) apply X-shear of 1 unit and compute new coordinate of rectangle ABCD. Apply Y-shear of 1 unit and compute new coordinate of rectangle ABCD.	[10]
4	a)	Give Liang Barsky Line clipping algorithm.	[10]
	b)	Explain Sutherland Hodgman polygon clipping algorithm	[10]
5	a)	With neat diagram explain Planer projection geometry.	[10]
	b)	Explain different traditional animation techniques.	[10]
6	a)	Describe with neat diagram Area Subdivision method	[10]
	b)	Describe with neat diagram Depth Buffer Method	[10]

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SE sem III CSE (AIML) 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

QP code : 10082556

SE sem III CSE (AIML) R-19 escheme

(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]

SE sem III CSE-AIML 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 $f(x) = 1, \quad 0 < x < 1.$
$= x, \quad 1 < x < 2$ **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

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**

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

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