END SEMESTER EXAMINATION (SIGCE NEP 2020)

QPCode:2532111

Subject Name: Mathematics for Computer Engineering
Subject Code: 2153111 Branch: IOT
Duration: 02:30 Hours

Date: 20/12/25
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 $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, 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 $A = \begin{bmatrix} 1 & 3 & 4 \\ 0 & -1 & 2 \\ 0 & 0 & -1 \end{bmatrix}$		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 $Minimise\ z = x_1 + 2x_2 + 3x_3$ $Subject\ to\ \ x_1 + x_2 + x_3 = 6$ $2x_1 + x_2 + 3x_3 = 10$		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. $Optimise\ z = 12x_1 + 8x_2 + 6x_3 - {x_1}^2 - {x_2}^2 - {x_3}^2 - 23$ $subject\ to\ x_1 + x_2 + x_3 = 10$ $x_1, x_2, x_3 \geq 0$		05
Q.3	Answer the following (**any two**)	3	**10**
a.	State Chinese-Remainder theorem and hence solve $x \equiv 2(mod3)$ $x \equiv 3(mod4)$ $x \equiv 2(mod5)$		05
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

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

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END SEMESTER EXAMINATION (SIGCE NEP 2020)

QP Code: 2532133

Date: 26/12/25

Subject Name Analysis of algorithm

Subject Code: 2153113 Branch: CSE IOT CS&BC

Duration: 2:30 Hr

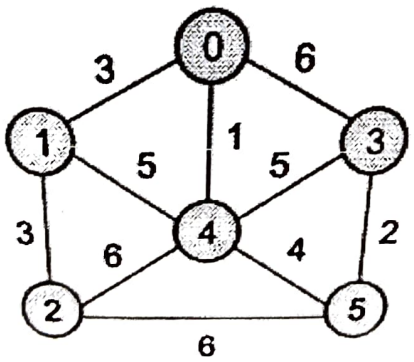
Sem: III

Max Marks: 60

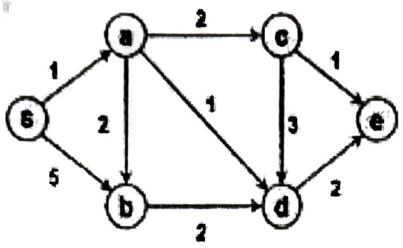
Note:

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.	Solve the following Recurrence using Master's Method. T(n) = 4T(n/2) + n.		4
b.	What is asymptotic analysis and define big oh, big omega and theta notation.		4
c.	Sort the following numbers using selection sort and show each step clearly. 55, 23, 89, 22, 14, 90.		4
Q.2	**Answer the following (any Two)**	**CO2**	**(10)**
a.	Apply Merge sort algorithm to sort the following numbers. Show each step clearly. 10, 5 ,7, 6, 1, 4, 8, 3, 2, 9.		5
b.	Write the algorithm and derive the complexity of the binary search algorithm.		5
c.	Explain quick sort with algorithm and example.		5
Q.3	**Answer the following (any Two)**	**CO 3**	**(08)**
a.	Write algorithm for greedy knapsack and obtain the solution to following fractional greedy knapsack problem where n=5, m=100, (p1, p2....p5) = (10,20,30,40,50) and (w1, w2, ..., w5) = (20, 30, 66, 40, 60).		4
b.	Find MST of the following graph using Prim's algorithm		4

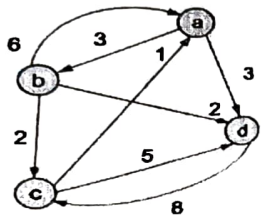


c. Find Shortest path from source vertex s using Dijkstra Algorithm. 4



Q.4 Answer the following (any Three) CO4 (15)

a. Write all pairs shortest path algorithm. Find all pairs shortest paths for a given graph. 5



b. Find the LCS for following strings 5
String 1- ACBAED
String 2- ABCABE

c. Consider 0/1 knapsack problem: 5
N=3, W=(4,6,8) and P=(10,12,15).
By using dynamic programming determine the optimal profit for the knapsack of capacity 10.

d. Discuss dynamic programming approach and its advantages over greedy method 5

Q.5 Answer the following (any Three) CO5 (15)

a. Explain N queen problem algorithm and solve for 4-Queen problem. 5

b. Write an algorithm to solve the sum of subset problem and solve the following problem. 5
n=4, W = {4, 5, 8, 9} Sum=9.

c. Discuss 15-pazzle problem using branch and bound strategy. 5

d. Demonstrate the working of Branch and bound techniques 5

Q.6 Answer the following (any one) CO6 (04)

a. Explain Naïve string matching algorithm with example. 4

b. What is knuth morris pratt method of pattern matching? Give Example. 4

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END SEMESTER EXAMINATION (SIGCE NEP 2020)

QP Code: 2532123

Subject Name: Discrete Structures and Graph Theory

Date: 31/10/25

Subject Code: 2153112 Branch: CSE (IOTCSBC)

Sem:III

Duration:2.30 Hours

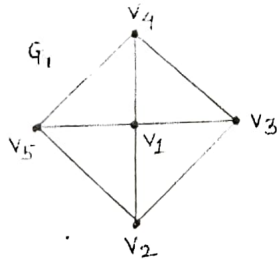
Max Marks: 60

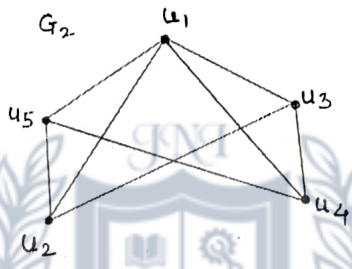
Note:

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

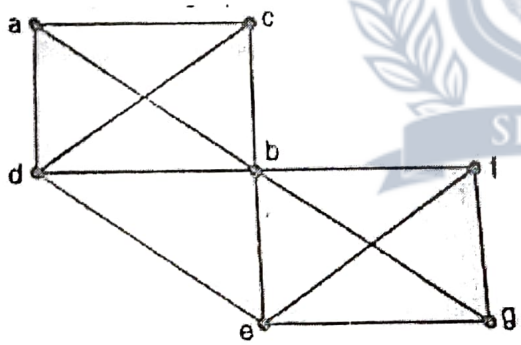
		CO	Marks
Q.1	**Answer the following (any Three)**	**CO1**	**(12)**
a.	Construct the Truth Table and Check if the following statement tautology $[(P \rightarrow Q) \wedge \neg Q] \rightarrow \neg P$		04
b.	Describe the term partition set with suitable example		04
c.	Explain two different types of Quantifiers with example.		04
d.	Prove using Mathematical Induction that sum of cubes of three consecutive integers is divisible by 9.		04
Q.2	**Answer the following (any Three)**	**CO2**	**(12)**
a.	Let A= {a,b,c,d,e} and let R be a relation on A. Let R={(a,a),(a,c),(b,b),(c,d),(c,e),(d,a),(e,b),(e,e) Compute transitive closure using Warshall's algorithm.		04
b.	Draw a Hasse Diagram of D12.		04
c.	Define POSET with an example.		04
d	What is a Equivalence relation ?Let A be a set of integers.Let R be a relation on A×A defined by (a,b)R(c,d) if and only if a+d=b+c.Prove that R is an Equivalence relation.		04
Q.3	**Answer the following (any three)**	**CO3**	**(06)**
a.	State the meaning of an injective function with a suitable example.		02
b.	Define Inverse Function.		02
c.	If f(x) =x+2, g(x) =2x+1, Find fog(x).		02
d.	Show that the function f : R ⇢ R, given by f(x) = 2x is onto.		02
Q.4	**Answer the following (any two)**	**CO4**	**(08)**
a.	State the Pigeonhole Principle.Show that if any five numbers from 1 to 8 are chosen then two of them will add to 9.		04
b.	Find the sequences from the Recurrence Relation $a_n=n(a_{n-1})^2$ where $a_0=1$, n>=1		04
c.	Explain Inclusive-Exclusive Principle with an example.		04

Q.5	**Answer the following (any two)**	**CO5**	**(10)**
a.	Define the following terms with an example. i) Monoid ii) Semi Group iii) Identity element iv) Commutative Ring v) Subgroup		05
b.	Consider the Set A={1,2,3,4,5,6 } under Multiplication Modulo 7 then Prove that it is a Cyclic group.		05
c.	Prove that the set A=(0,1,2,3,4,5) is a finite Abelian Group under addition Modulo 6.		05
Q.6	**Answer the following (any Three)**	**CO6**	**(12)**
a.	Determine whether the following Graphs are Isomorphic or Not? Justify.		04





b.	Check Whether Euler path and Euler Cycle exist in the below Graph.If yes mention them.		04



c.	Define the Following terms: i)Planer Graph ii)Hamiltonian Graph iii)Cut vertex iv)Circuit		04
d	Find the number of vertices of the graph having 16 edges if degree of each vertex is 2.		04

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END SEMESTER EXAMINATION (SIGCE NEP 2020) **QP Code: 2532153**

Subject Name: - Fintech Start-up **Date:** 10/11/2025

Subject Code:2153311 **Branch: SE CSE (IOTCSBC)** **Sem: III**

Duration: 2.5 Hours **Max Marks: 60**

		CO	Marks
Q.1	**Answer the following (any three)**	**CO1**	**(15)**
a.	Discuss the evolution of Fintech in the investment sector.		5
b.	Explain the role of Fintech in transforming traditional investment methods.		5
c.	Summarise the benefits and limitations of automated investing platforms.		5
d.	Describe the concept of Algorithmic Trading.		5
Q.2	**Answer the following (any three)**	**CO2**	**(15)**
a.	Define Fintech. Explain its scope in investment management.		5
b.	How Machine Learning used in investment decision-making.		5
c.	What are the functions of algorithmic trading platforms in financial markets.		5
d.	Justify the importance of data-driven investment tools.		5
Q.3	**Answer the following (any three)**	**CO3**	**(15)**
a.	What is Blockchain Technology? Explain its application in finance.		5
b.	What are Digital Assets? Explain with examples.		5
c.	How blockchain enhances transparency and security in transactions.		5
d.	State the importance of Ethics in Fintech and investment practices.		5
Q.4	**Write a short note on: (any three)**	**CO4**	**(15)**
a.	Cryptocurrencies as investment assets.		5
b.	Key challenges in cryptocurrency investment?		5
c.	Impact of RBI and SEBI regulations on Fintech operations.		5
d.	Fintech innovations in financial markets.		5

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END SEMESTER EXAMINATION (SIGCE NEP 2020)

QPCode:2532143

Subject Name: Computer Organization and Architecture

Date: 07/11/2025

Subject Code: 2153114 Branch: IoT&CSBC

Sem: III

Duration: 2.30 hours

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 one)**	**CO1**	**(05)**
a.	Explain with a diagram the Von Neumann architecture.		5
b.	Convert the following numbers into 2's compliment: i) $(35)_{10}$ ii) $(23)_{10}$		5
Q.2	**Answer the following.**	**CO2**	**(15)**
a.	Draw the flow chart of Booth's multiplication algorithm and solve $(-4)_{10}*(2)_{10}$.		10
b.	Write short note on (any one) i) Floating point representation. ii) Restoring division algorithm		5
Q.3	**Answer the following (any three)**	**CO3**	**(15)**
a.	Discuss in detail the flag register of the 8086 processor.		5
b.	Explain with example the addressing mode of 8086.		5
c.	What is instruction interpretation and instruction sequencing?		5
d.	Write note on Hardwired control unit.		5
Q.4	**Answer the following (any two)**	**CO4**	**(10)**
a.	Explain with a diagram the process of segmentation.		5
b.	List out any 2 cache memory mapping techniques		5
c.	Describe the process of MESI protocol.		5
Q.5	**Answer the following (any one)**	**CO5**	**(05)**
a.	which are the different methods of bus arbitration.		5
b.	With respect to I/O unit explain: i) I/O interface ii) I/O Modules		5
Q.6	**Answer the following (any two)**	**CO6**	**(10)**
a.	Compare the operating modes of the 80386 processor.		5
b.	Explain with a diagram the superscalar architecture.		5
c.	Describe in detail the Flynn's Classification.		5

SE sem III CSE (IOT) R-19 C scheme

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

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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SE sem III CSE(IOT) 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.

b. Let A={0,1,2,3,4,5} 10
   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

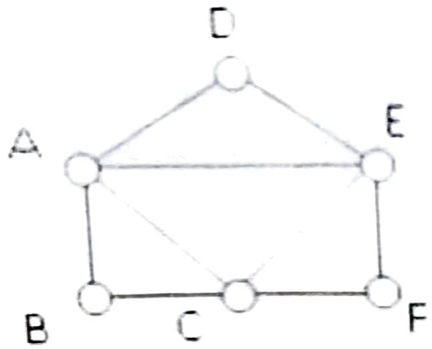
c For the set A= {2,3,6,12,24,36}, a relation R defined by divisibility Answer the following 8
   a) Draw the Hasse Diagram
   b) What are the maximal and Minimal elements
   c) Is the poset Lattice?
Give one example of chain and antichain

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
$1+5+9+\ldots\ldots+(4n-3) = n(2n-1)$

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



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

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 $a_n + 2a_{n-1}$ 8
$= n+3$ for $n \geq 1$ and $a_0=3$

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

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Qlcode) 10082837

SE Sem III rd CSE (IOT) R-19 eschema

Total Marks 80

(3 Hours)

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 a) Define and explain the following terms with example [05]
   i. Scan Conversion
   ii. Rasterization

b) Prove that two successive rotations are additive i.e $R(\theta_1).R(\theta_2) = R(\theta_1+\theta_2)$ [05]

c) Write a flood fill procedure to fill a polygon using the 8-connected approach. [05]

d) Write short notes on [05]
   i. Motion Capture in Animation
   ii. Animation Deformation

2 a) Write a Bresenham's Line Drawing Algorithm. Apply this algorithm to find pixel coordinates along the line path. The endpoint coordinates of the line segment are (9, 18) and (14, 22) [10]

b) Define window and viewport. Derive the composite transformation matrix for a window-to-viewport transformation. [10]

3 a) Derive a 2D composite transformation matrix to reflect an object about a line, y = mx [10]

b) Explain what is meant by the Bspline curve. Also, explain the properties of the Bezier and Bspline curve. [10]

4 a) Write and explain the hidden surface removal algorithm with an example [10]

b) What are the drawbacks of the Sutherland Hodgeman polygon clipping algorithm? How Weiler Atherton polygon clipping algorithm overcome these drawbacks? [10]

5 a) Discuss and derive all equations of midpoint Circle drawing algorithm and write an algorithm [10]

b) Clip the line segment using the Cohen Sutehrland line clipping algorithm. The Coordinates of window boundaries are (Xwmin, Ywmin) = (4, 4) and (Xwmax, Ywmax) = (10, 9), and the coordinates of two endpoints of a line segment are (2, 5) and (8, 11) [10]

6 a) What is animation? What is traditional animation technique? Explain any 5 principles of animation. [05]

b) Explain parallel and perspective projections. Derive the matrix for the perspective projection. [05]

c) Write short note on Raster scan display [05]

d) What is an antialiasing? Explain any 3 antialiasing techniques [05]

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QP code : 10081973

SE sem-III CSE (IOT) R-19 C scheme

TIME: 03 HOURS **MAX. MARKS : 80**

Note:
1. Question **No. 1** is compulsory.
2. Attempt **any three** questions out of remaining **five** questions.
3. Assume suitable data wherever necessary.
4. Figures to right indicate full marks.

			Marks
Q.1		Answer the following **(Any four)**	
	a.	Find the Laplace transform of $t\sin^3 t$.	05
	b.	Calculate the Spearman's rank correlation coefficient R.	05

X	10	12	18	18	15	40
Y	12	18	25	25	50	25

	c.	Find the constants a, b, c, d ,e if f (z) = $(a\,x^3 + bx\,y^2 + 3x^2 + cy^2 + x) + i\,(dx^2y - 2y^3 + e\,x\,y + y)$ is analytic.	05
	d.	Find inverse Laplace transform of $tan^{-1}\left(\frac{s+a}{b}\right)$.	05
Q.2	a.	Evaluate by using Laplace transform of $\int_0^\infty \left(\frac{\sin 3t + sn\,2t}{te^t}\right)$ dt.	06
	b.	If the mean of the following distribution is 16 find m, n and variance X : 8 12 16 20 24 P (X= x) : $\frac{1}{8}$ m n $\frac{1}{4}$ $\frac{1}{12}$	06
	c.	Obtain the Fourier expansion of $f(x) = \left(\frac{\pi - x}{2}\right)^2$ in $(0, 2\pi)$ Hence show that $\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2}$	08
Q.3	a.	Find the analytic function f (z) = u + i v in terms of z if $u + v = e^x(\cos y + \sin y) + \frac{x-y}{x^2+y^2}$.	06
	b.	Find the coefficient of regression and hence the equations of the lines of regression for the following data	06

X	78	36	98	25	75	82	90	62	65	39
Y	84	51	91	60	68	62	86	58	53	47

	c.	Using convolution theorem Find the inverse Laplace transform of $\frac{1}{(s^2 + 4s + 13)^2}$	08

Q.4 a. Obtain Fourier series of f (x) = |sin x| in $((-\pi, \pi)$. **06**

b. If X denotes the outcome when a fair die is tossed, find the moment generating function of x and hence find the mean and variance of X. **06**

c. Evaluate by using Laplace transforms of $\int_0^\infty e^{-t}\,(t\int_0^t e^{-4u}\cos u\,du)dt$. **08**

Q.5 a. Find the orthogonal trajectories of family of curves $3x^2y + 2x^2 - y^3 - 2y^2 = c$. **06**

b. Find the inverse Laplace transform of $\frac{s+29}{(s+4)(s^2+9)}$. **06**

c. Fit a second-degree parabolic curve to the following data and estimate the Production in 1982. **08**

Year (X)	1974	1975	1976	1977	1978	1979	1980	1981
Production (y)(in tons)	12	14	26	42	40	50	52	53

Q.6 a. Obtain half range Sine series for f (x) = x- x^2 in $0 \le x \le 1$. **06**

Hence show that $\frac{\pi^3}{32} = \frac{1}{1^3} - \frac{1}{3^3} + \frac{1}{5^3} - \frac{1}{7^3} \ldots\ldots$

b. Show that the function $v = e^{2x}(y\cos 2y + x\sin 2y$ *is* harmonic. **06**
And find its corresponding analytic function f (z) = u + i v.

c. Find the value of k if the function f (x) = k $x^2(1 - x^3)$, $0 \le x \le 1$ **08**
f (x) = 0 otherwise .
Is a probability density function. Also find p ($0 \le x \le \frac{1}{2}$) find mean and variance.

SE/ sem-IV / R-19 C-scheme / DSGT/ CSE-IOT (KT)

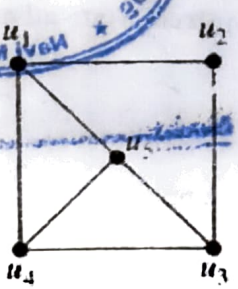
Paper / Subject Code: 49382 / Discrete Structures & Graph Theory

Time: **Marks: 80**

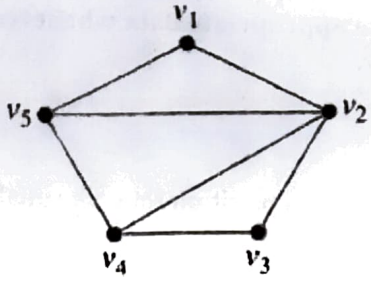
N.B. : (1) Question Number 1 is compulsory2)Solve any three questions from the remaining questions
3) Make suitable assumptions if needed
4) Assume appropriate data whenever required. State all assumptions clearly.

1.	a.	Explain the following terms partition set with suitable example. 1. Partition set 2. Disjoint sets	5
	b.	Construct the Truth Table and check if the following statement is tautology. **$(P \rightarrow Q) \leftrightarrow (\neg Q \rightarrow \neg P)$**	5
	c.	Let f : A→B be a Function from A to B . Prove that f^{-1} exists if and only if f is a Bijective Function.	5
	d.	Prove by mathematical induction that **$x^n - y^n$ is divisible by x-y**	5
2	a	Define Equivalence Relation. A relation R is called circular if aRb and bRc imply cRa. Show that R is circular if and only if it is an Equivalence Relation	8
	b.	Let A = {1,2,3,4} and R= {(1,1), (1,2), (1,4), (2,4), (3,1), (3,2), (4,2), (4,3), (4,4)}. Find Transitive Closure of R using Warshall's algorithm.	8
	c	Let f: R → R be a function defined by f(x)=2x-3. Prove that it is Bijective & find inverse.	4
3	a	Let f,g,h be functions on real numbers R defined as follows: f(x) = 2x+5, g(x) = 5x + 3, h(x) = 3x Find: 1) fog 2) g o f 3) g o h 4) f o g o h 5) g o f o h	8
	b	Give the generating function for the following sequences 1) {0,1,2,3,4…} 2){1,2,3,4,5 …} 3) {2,2,2,2,2...} 4) { 0,0,0,1,1,1,1,…}	8

c Determine whether the following graphs are isomorphic. Justify your answer. 4



G1



G2

4 a A Function $f: R - \{(7/3)\} \rightarrow R - \{4/3\}$ is defined as $f(x) = (4x - 5)/(3x - 7)$ 8

Prove that f is Bijective and find the rule for f^{-1}

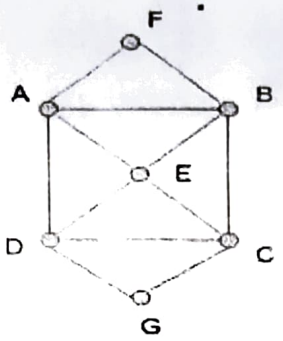
b Show that the (2, 5) encoding function $e: B^2 \rightarrow B^5$ defined by 8

$e(00) = 00000$ $e(01) = 01110$

$e(10) = 10101$ $e(11) = 11011$ is a group code.

c How many numbers must be selected from the set {1,2,3,4} to guarantee that at least one pair of these will add up to 7. 4

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 Prove that the set of Real numbers under * defined by **a*b=a+b-2** is a group

c Find the complement of each element in D_{42} 4

6. a Draw the Hasse Diagram of D_{60} and check whether it is a Lattice. 8

b Solve the recurrence relation $a_{n+2} - 5a_{n+1} + 6a_n = 2$ 8

with initial conditions $a_0=1$, $a_1 = -1$

c Define the following with suitable example. 4
a)Equivalence Class b) Sub group c) Distributive Lattice d) Injective Function

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Qlcode: 10082557

SE Sem IIIrd CSE (IOT) 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	Differentiate between arrays and linked lists.	[05]
	B	Define data structure and Explain types of data structures.	[05]
	C	Write a program in C to reverse a string using stack.	[05]
	D	Explain the concept of a queue ADT and describe a real-world application where queues are useful.	[05]
Q2	A	Write a program to perform following operations on the Doubly linked list a) Create the list b) Insert element at the beginning c) Insert element at the end d) Delete last element of the list	[10]
	B	Explain the process of deleting a node from a Binary Search Tree(BST). Illustrate the cases of deletion with examples.	[10]
Q3	A	Write a program in C to convert a given infix expression into 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: A:5, B:9, C:12, D:13, E:16	[10]
Q4	A	Construct an AVL tree by inserting the following elements in sequence, showing the tree after each insertion and rotation: 30, 20, 10, 25, 40, 50, 5, 6, 11, 12.	[10]
	B	Write a program in C to implement stack ADT using an array.	[10]
Q5	A	Explain the key differences between a singly linked list, a doubly linked list, and a circular linked list. Use diagrams to show the structure of each type and discuss the advantages and disadvantages of each.	[10]
	B	Write a program in C to implement circular queue using linked list.	[10]
Q6	A	Explain Depth First search and Breadth First search graph traversal techniques with example.	[10]
	B	A hash table has 10 slots, and the following keys are inserted in this order: 21, 33, 40, 98, 51, 64, 10, 75, 4, 86. 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 % 10.	[10]

QPcode: 10081925

SE Sem III rd CSE(IOT) R-19 Cscheme

Time :(3 hours) **Total Marks: 80**

N.B. 1. Question **No. 1** is compulsory
2. Attempt any **three** questions from remaining five questions
3. Assume suitable data if **necessary** and justify the assumptions
4. Figures to the **right** indicate full marks

Q1	A	Explain the Register organization of processor	**05**
	B	Describe the Full Adder circuit with a neat diagram and truth table	**05**
	C	Explain the IEEE 754 standards for representation of floating point numbers	**05**
	D	Draw the detailed Von-Neumann Architecture and explain in brief	**05**
Q2	A	Draw the flow chart of Non Restoring division algorithm and Perform 6 ÷2	**10**
	B	Explain the instruction cycle with the help of a neat state diagram	**10**
Q3	A	Draw the Flowchart for the Booth's Algorithm for signed integer multiplication and perform the multiplication between 6 and 2 using this Algorithm	**10**
	B	Explain the various methods of designing a hardwired control unit	**10**
Q4	A	Consider a fully associative mapped cache with block size 4 KB. The size of main memory is 16 GB. Find the number of bits in tag.	**10**
	B	Explain Flynn's classification	**10**
Q5	A	What is the difference between Computer organization and Computer architecture explain it with a example	**05**
	B	Differentiate between Interleaved and Associative Memory	**05**
	C	Explain Instruction pipelining and the hazards associated with it .	**10**
Q6		Write short notes on	**20**
	A	.Logic Gates	
	B	Flip Flops	
	C	Cache Coherence	
	D	PCI Bus	

qp code : 10082556

SE sem III CSE(IOT) 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 CSE (IOT) R-19 Cscheme

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**

(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 : 10095544

SE Sem III CSE (IOT) R-19 C scheme

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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