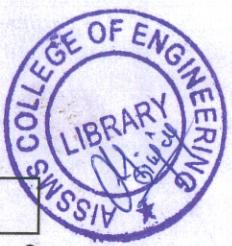


S.E Computer Question Paper



Total No. of Questions : 4]

SEAT No. :

PA-20

[Total No. of Pages : 2]

[5931]-30

S.E. (Computer Engineering and AI & DS and Computer Science & Design Engineering) DISCRETE MATHEMATICS (2019 Pattern) (Semester - I) (210241)

Time : 1 Hour]

[Max. Marks : 30]

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable data, if necessary.

Q1) a) Let $U = \{1, 2, 3, \dots, 10\}$, $A = \{2, 4, 6, 8, 10\}$, $B = \{1, 3, 5, 7, 9, 10\}$ [6]

Find:

- i) $(A \cup B)'$
- ii) $(A \cap B)'$
- iii) $(B)'$
- iv) $(B-A)'$

b) Let p be "Mark is Rich" and q be "Mark is happy" write each of following in symbolic form [4]

- i) Mark is poor but happy
- ii) Mark is neither rich nor happy
- iii) Mark is either rich or happy
- iv) Mark is Rich and not happy

c) Explain terms Tautology and Contradiction in truth table with an example. [5]

OR

Q2) a) By using mathematical induction show that $1+2+3+\dots+n = n(n+1)/2$ for all natural number values of n . [6]

P.T.O.

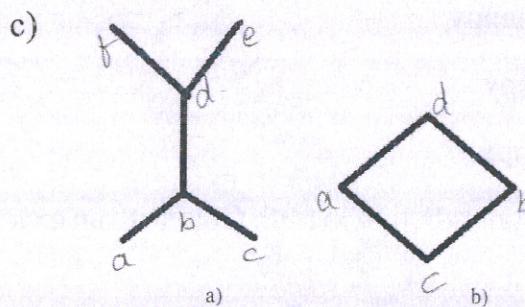


- b) Explain following terms with example. [4]
- Symmetric difference between set
 - Union of set
 - Intersection of Set
 - Subset of a Set
- c) A college Records gives following information : 119 students enrolled in Introductory computer science, 96 of them took data structures, 53 took foundations, 39 took assembly language, 31 took both foundation and Assembly language, 32 took both data structures and Assembly language, 38 took data structures and foundations and 22 took all of three courses is this information correct? Why? [5]

- Q3)** a) What is Equivalence relation? Explain properties of binary relations. [5]
- b) Let $A = \{1, 2, 3, 4\}$ and $R = \{(1, 2), (2, 4), (1, 3), (3, 2)\}$, Find transitive closure of relation R using Warshall's algorithm. [5]
- c) Let $A = \{1, 2, 3, 4, 12\} = B$, and let aRb if a divides b, Write a relation and draw it's Hasse diagram. [5]

OR

- Q4)** a) Let $f(x) = 2x+3$, $g(x) = 3x+4$, $h(x) = 4x$ find gof , fog , foh , goh [5]
- b) $A = \{1, 2, 3, 4, 5, 6\} = B$
 $R = \{(i, j) \mid |i - j| = 2\}$
- Find whether R is equivalence relation or not [5]



Find whether above posets are lattices or no? [5]

✗ ✗ ✗

Total No. of Questions : 4]

SEAT No. :

PA-21

[Total No. of Pages : 2

[5931] 31

S.E. (Electronics & Computer/Artificial Intelligence & Data Science)

FUNDAMENTALS OF DATA STRUCTURES

(2019 Pattern) (Semester - I) (210242)

Time : 1 Hour

[Max. Marks : 30

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) Define the following terms with suitable example. [4]

- i) Data Structure
- ii) Abstract Data Type
- iii) Algorithm
- iv) Flowchart

b) What is frequency count? Why is frequency count important in the analysis of algorithm. [5]

c) Write an algorithm to compute the sum of the digits of the given number. Justify that your algorithm satisfies all the characteristics of an algorithm. [6]

OR

Q2) a) Give complete classification of data structures with one example of each. [4]

b) Explain divide & conquer Strategy and Greedy strategy with suitable example. [5]

c) Draw flowchart to check whether a given number is a perfect square of an integer. What is the time complexity of your algorithm. [6]

P.T.O.

- Q3)** a) What are advantages & disadvantages of sequential organization of data structure? [4]
- b) Explain row major & column major representation of arrays in computer memory. [5]
- c) Write an algorithm to perform polynomial addition state the time complexity of the algorithm. [6]

OR

- Q4)** a) Write a short note on storage representation of an array. [4]
- b) Write pseudo code to reverse the numbers in one dimensional array. [5]
- c) Write an algorithm to perform sparse matrix addition & state its time complexity. [6]

Total No. of Questions :4]

SEAT No. :

PA-22

[5931]-32

[Total No. of Pages : 1

(Electronics & Computer /A.I. & D.S./ Computer Science & Design Engineering)

**OBJECT ORIENTED PROGRAMMING
(2019 Pattern) (Semester-I) (210243)**

Time : 1 Hour]

[Max. Marks : 30]

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4.
- 2) Assume suitable data, if necessary.

- Q1)** a) What is the use of 'this' pointer. Explain with Example [4]
b) What are the different ways to define member functions of a class? Give Examples of Each [4]
c) Define inline function. Write a C++ program for finding the area of a triangle using inline functions. [7]

OR

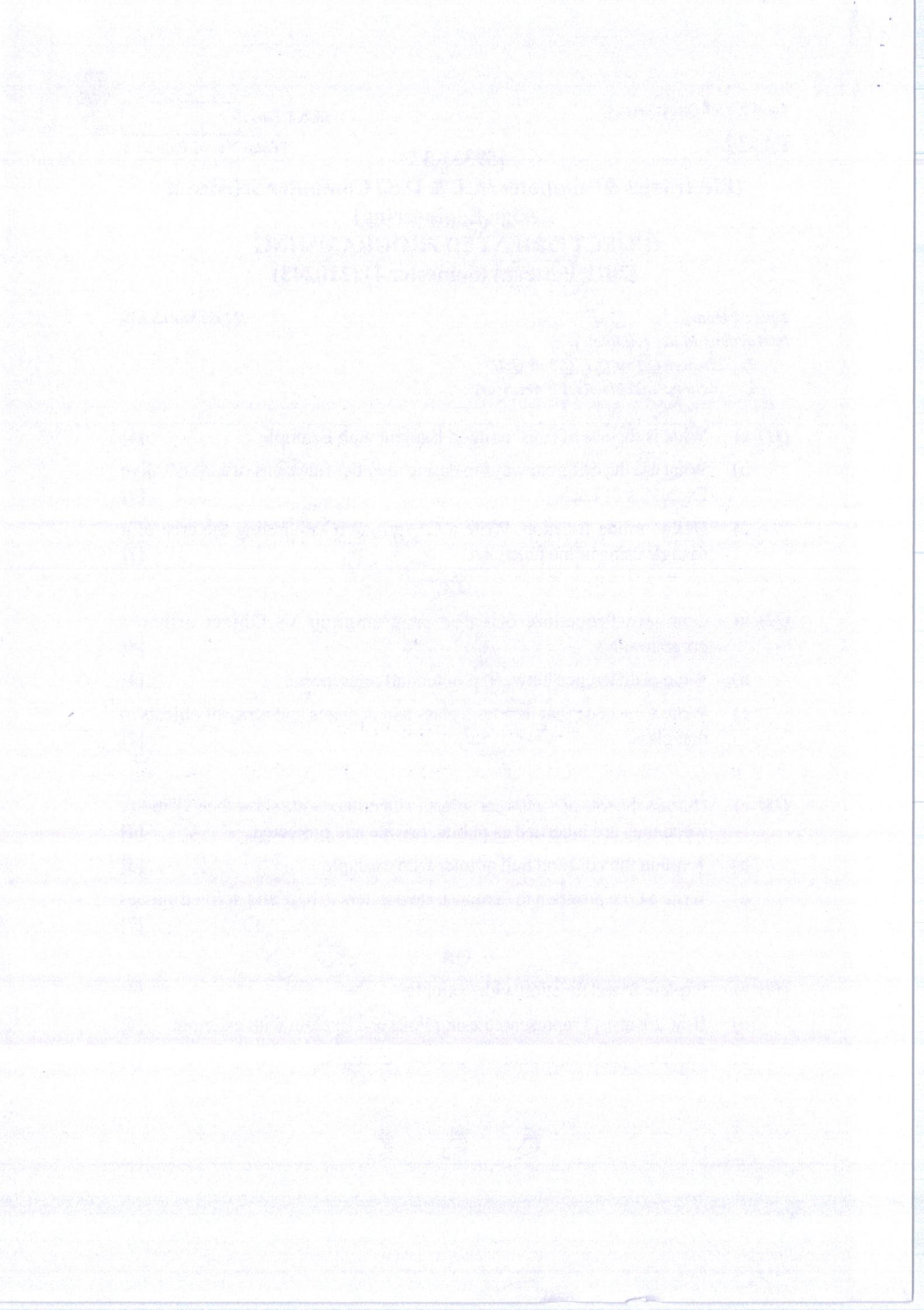
- Q2)** a) Compare Procedure oriented programming Vs Object oriented programming [4]
b) What is difference between pointer and references? [4]
c) Write C++ code that defines a class and declares and array of objects to that class [7]

- Q3)** a) Discuss the role of access specifiers in inheritance and show their visibility when they are inherited as public, private and protected. [4]
b) Explain the void and null pointer with example [4]
c) Write a C++ program to demonstrate pointers to base and derived classes [7]

OR

- Q4)** a) Explain friend function with example. [4]
b) How are arrays represented using Pointers. Explain with example [4]
c) Explain hybrid inheritance with a C++ example. [7]





Total No. of Questions : 6]

SEAT No. :

PA-23

[Total No. of Pages : 2

[5931]-33

**S.E. (Computer/Artificial Intelligence & Data Science/Computer
Science & Design Engineering)
COMPUTER GRAPHICS
(2019 Pattern) (Semester - I) (210244)**

Time : 1 Hour

[Max. Marks : 30

Instructions to the candidates:

- 1) Answer Q.1 or Q.2 and Q.3 or Q.4 and Q.5 or Q.6.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Define the terms: color depth, scan conversion, refresh rate, pixel. [4]

b) Differentiate between Raster Scan and Random Scan. [4]

OR

Q2) a) Define the terms: resolution, aspect ratio, frame buffer, refresh rate. [4]

b) Compare DDA line drawing Algorithm with Bresenham's Line drawing algorithm. [4]

Q3) a) Write short note on "Handling Keyboard inputs with GLUT". [6]

b) Explain significance of error term in Bresenham's circle drawing algorithm. Explain its mathematical derivations. [6]

OR

Q4) a) Describe OpenGL architecture with block diagram in detail. [6]

b) Explain Bresenham's circle drawing algorithm in detail. [6]

P.T.O.

Q5) a) Write and explain with example Sutherland-Hodgeman clipping algorithm. [5]

b) Let ABCD be the rectangular window with A(20, 20), B(90, 20), C(90, 70), and D(20, 70). Find region codes for endpoints and use the Cohen-Sutherland algorithm to clip the lines : (i) P1 P2 with P1 (10, 30), P2 (80, 90). [5]

OR

Q6) a) Explain with an example Boundary fill Algorithm. [5]

b) Clip the line PQ having coordinates P(4, 1) and Q(6, 4) against the clip window having vertices A(3, 2), B(7, 2) C(7, 6) D(3, 6). Use cohen-sutherland algo. [5]

Total No. of Questions : 6

SEAT No. :

PA-24

[Total No. of Pages : 2

[5931] - 34

S.E. (Computer Engineering)

DIGITAL ELECTRONICS AND LOGIC DESIGN

(2019 Pattern) (Semester - I) (210245)

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates :

- 1) Attempt Q.1 or Q.2, Q.3 or Q.4., Q.5 or Q.6.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data if necessary.

- Q1)** a) Simplify the expression $F(A,B,C,D) = \sum m(3,4,5,7,9,13,14,15)$ using the K-map method. [5]
b) Simplify the expression $F(A,B,C,D) = \pi M(0,1,4,5,6,8,9,12,13,14)$ using the K-map method. [5]

OR

- Q2)** a) Simplify the following logic function using the Quine-McCluskey minimization technique. [8]

$$Y(A,B,C,D) = \sum m(0,1,3,7,8,9,11,15).$$

- b) Express the function $Y = AB+ACD$ in canonical sum of product form. [2]

- Q3)** a) Implement the following Boolean function using 8 : 1 multiplexer [5]

$$F(A,B,C,D) = \sum m(2,4,5,7,10,14).$$

- b) Design 4 bit binary to gray code converter circuit using logic gates. [5]

OR

- Q4)** a) Explain the rules for BCD addition with suitable example and Design one digit BCD adder using IC 7483. [5]

- b) How will you implement full adder using half adder? Explain with circuit diagram. [5]

P.T.O.

- Q5)** a) Explain look Ahead carry generator in detail. [5]
b) Simplify the expression $F(A,B,C,D) = \sum m(1,3,7,11,15) + d(0,2,5)$ using the K-map method. [5]

OR

- Q6)** a) What do you mean by parity? Design 3 bit parity generator circuit using even parity bit. [5]
b) Minimize the following expression using the K-map with minimum hardware. [5]

$$Y = \sum m(1,5,6,7,11,12,13,15)$$



Total No. of Questions: 8]

SEAT No. :

PA-1233

[5925]-255

[Total No. of Pages : 5

**S.E. (Computer Engg./Computer Science and Design Engineering/
Artificial Intelligence & Data Science)**

DISCRETE MATHEMATICS

(2019 Pattern) (Semester-III) (210241)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 Q.7 Q.8.
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Assume suitable data wherever necessary.

Q1) a) The company has 10 members on its board of directors. In how many ways can they elect a president, a vice president, a secretary and treasure. [6]

b) Find eighth term in the expansion of $(x+y)^{13}$ [6]

c) A box contains 6 white and 5 black balls. Find number of ways 4 balls can be drawn from the box if [6]

- i) Two must be white
- ii) All of them must have same colour

OR

Q2) a) In how many ways can word the 'HOLIDAY' be arranged such that the letter I will always come to left of letter L. [6]

b) In how many ways can one distribute 10 apples among 4 children [6]

c) Use Binomial theorem to expand $(X^4+2)^3$ [6]

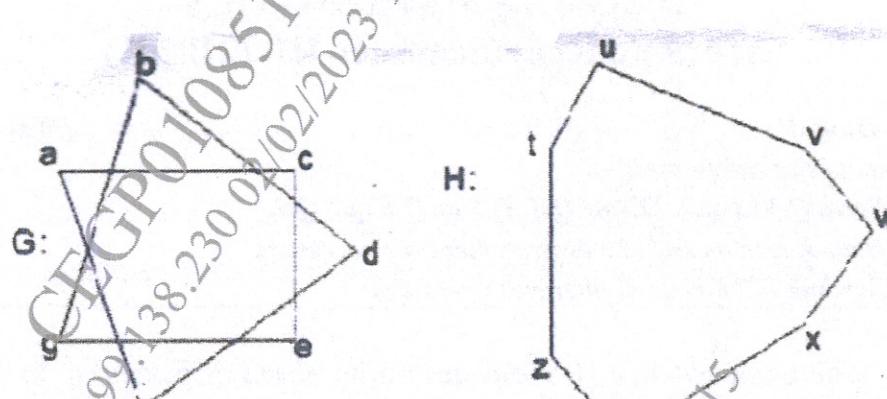
Q3) a) Is it possible to draw a simple graph with 4 vertices and 7 edges. Justify? [7]

b) Define following terms with example. [5]

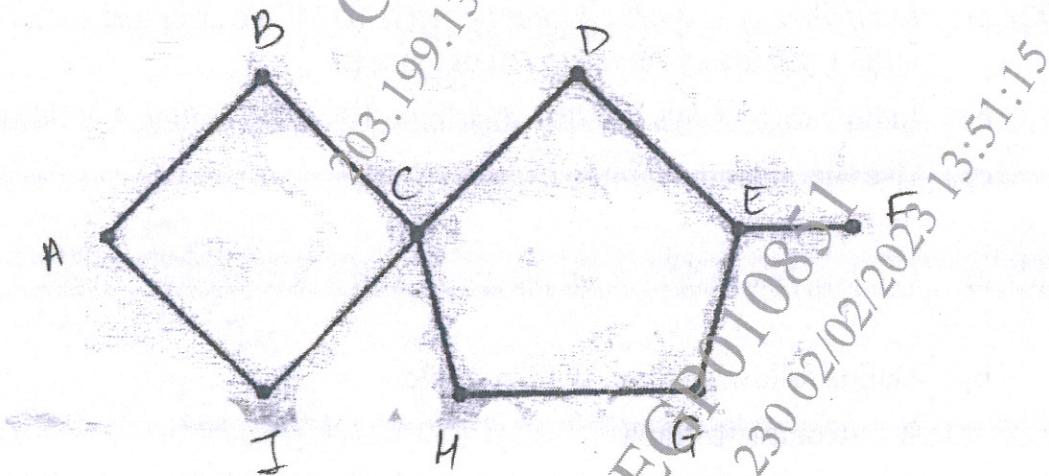
- i) Complete graph
- ii) Regular graph
- iii) Bipartite graph
- iv) Complete bipartite graph
- v) Paths and circuits

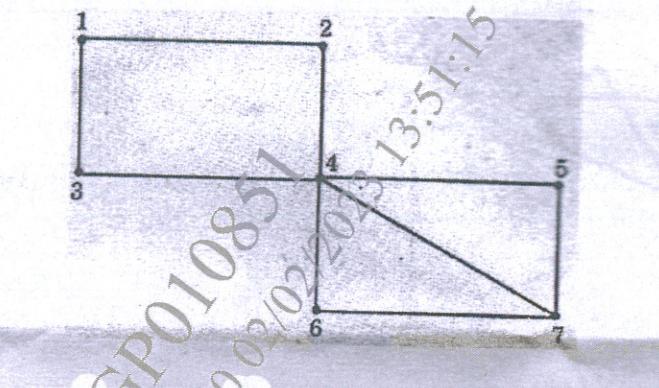
P.T.O.

- c) The graphs G and H with vertex sets $V(G)$ and $V(H)$, are drawn below. Determine whether or not G and H drawn below are isomorphic. If they are isomorphic, give a function $g: V(G) \rightarrow V(H)$ that defines the isomorphism. If they are not explain why they are not. [5]



- Q4) a) Determine which if the graph below represents Eulerian circuit, Eulerian path, Hamiltonian circuit and Hamiltonian Path. Justify your answer [7]





- b) A connected planar graph has nine vertices with degree 2,2,2,3,3,3,4,4,5 [5]

Find

- number of edges
 - number of faces
 - construct two such graphs
- c) Explain the following statement with example [5]

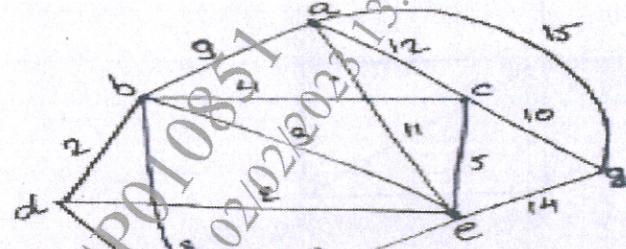
“Every graph with chromatic number 2 is bipartite graph”

- Q5)** a) Construct Huffman tree. [6]

A	5
B	6
C	6
D	11
E	20

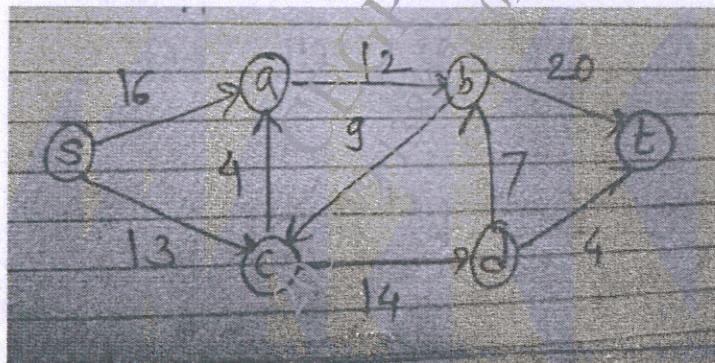
- b) Explain [6]
- Cutset
 - Tree properties
 - Prefix code

- c) Give the stepwise construction of minimum spanning tree using Prims algorithm for the following graph. Obtain the total cost of minimum spanning tree. [6]



OR

- Q6) a) Using the labelling procedure to find maximum flow in the transport network in the following figure. Determine the corresponding minimum cut. [6]



- b) Define with example. [6]
- Level and height of a tree.
 - Binary search tree.
 - Spanning tree

- c) Construct binary search tree by inserting integers in order [6]
 50,15,62,5,20,58,91,3,8,37,60,24

Find

- i) No of internal nodes
- ii) leaf nodes

- Q7** a) Let $R = \{0, 60, 120, 180, 240, 300\}$ and * binary operation so that for a and b in R, a^*b is overall angular rotation corresponding to successive rotations by a and by b. show that $(R, *)$ is a group. [6]

- b) Following is the incomplete operation table of 4-element group. Complete the last two rows. [6]

*	e	a	b	c
e	e	a	b	c
a	a	b	c	e
b				
c				

- c) Explain Algebraic system and properties of binary operations. [5]

OR

- Q8** a) Explain the following terms with examples

- i) Ring with unity
- ii) Integral domain
- iii) Field

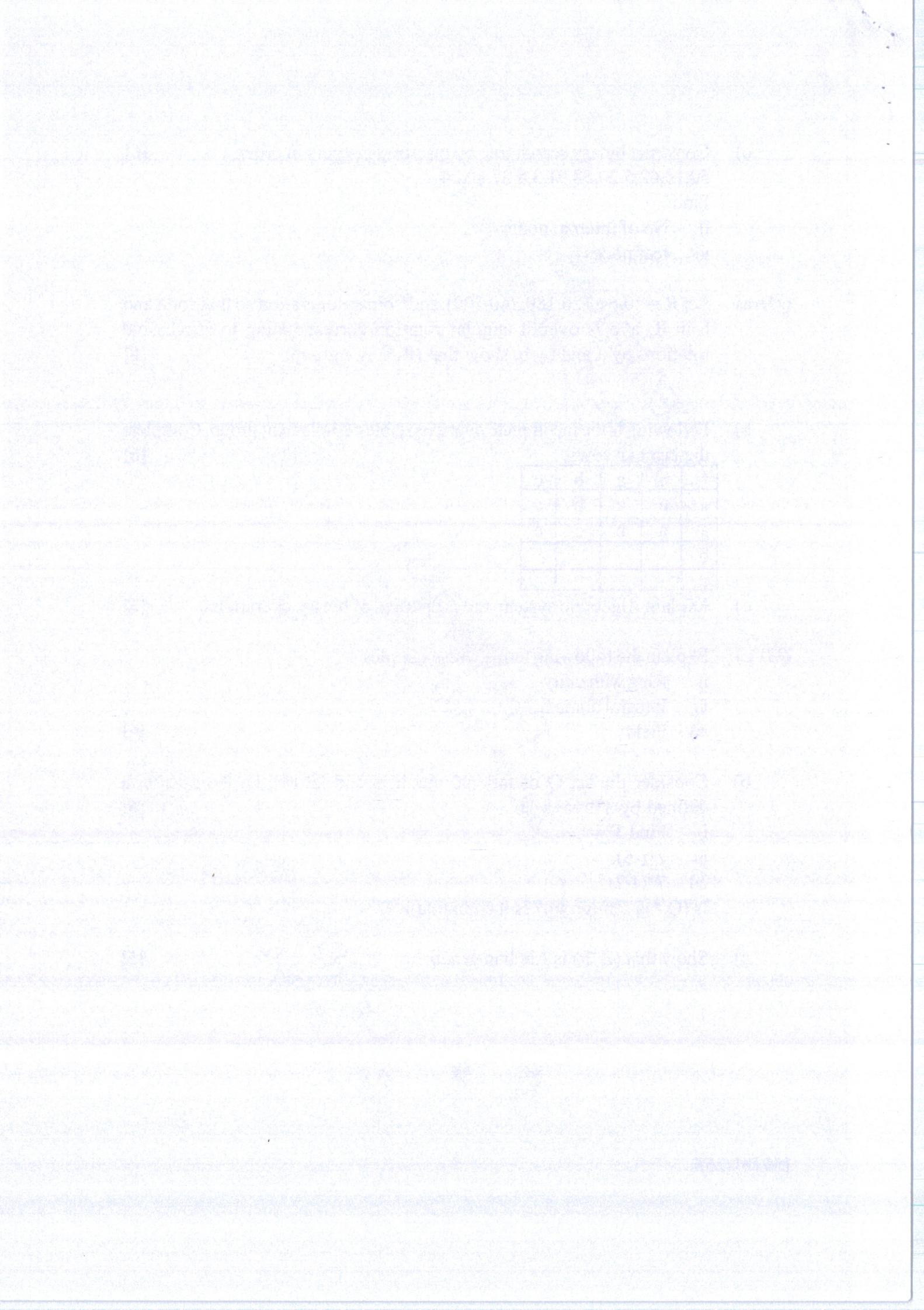
[6]

- b) Consider the set Q of rational numbers and let a^*b be the operation defined by $a^*b=a+b-ab$. [6]

- i) Find 3^*4
- ii) $2^*(-5)$,
- iii) $7^*(1/2)$

Is $(Q, *)$ a semigroup? Is it commutative?

- c) Show that $(Z_n \oplus)$ is Abelian group [5]



Total No. of Questions : 8]

PA-1234

SEAT No. :

[Total No. of Pages : 2

[5925]-256

S.E. (Computer /AI&DS)

FUNDAMENTALS OF DATA STRUCTURES

(2019 Pattern) (Semester - III) (210242)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Make suitable assumption whenever necessary.

- Q1) a)** Write pseudo 'Python' algorithm (recursive) for binary search. Apply your algorithm on the following numbers stored in array from A[0] to A[10] 9, 17, 23, 38, 45, 50, 57, 76, 90, 100 to search numbers 10 & 100. [9]
b) Explain the quick sort algorithm. Show the contents of array after every iteration of your algorithm start from following status of array.
27, 76, 17, 9, 57, 90, 45, 100, 79. [9]

OR

- Q2) a)** Explain in brief the different searching techniques. What is the time complexity of each of them? [9]
b) Write an algorithm of selection sort and sort the following numbers using selection sort and show the contents of an array after every pass:-
81, 5, 27, -6, 61, 93, 4, 8, 104, 15 [9]

- Q3) a)** What is linked list? Write a pseudo C++ code to sort the elements. [9]
b) What is doubly linked list? Explain the process of deletion of an element from doubly linked list with example. [9]

OR

- Q4) a)** Explain Generalized Linked List with example. [9]
b) Write Pseudo C++ code for addition of two polynomials using singly linked list. [9]

P.T.O.

- Q5)** a) Write an algorithm for postfix evaluation with suitable example. [8]
b) What is concept of recursion? Explain the use of stack in recursion with example. [9]

OR

- Q6)** a) What is need to convert the infix expression into postfix; convert the following expression into postfix expression $(a+b)^* d + e/(f + a^*d) + c$. [8]

- b) What is backtracking algorithm design strategy? How stack is useful in backtracking [9]

- Q7)** a) Write pseudo C++ code to represent dequeue and perform the following operations on dequeue: [8]

- Create
- Insert
- Delete
- Display

- b) What is circular queue? Explain the advantages of circular queue area over linear queue. [9]

OR

- Q8)** a) Define queue as an ADT. Write pseudo C++ code to represent queue. [8]

- b) Explain Array implementation of priority queue with all basic operations. [9]

• • •

Total No. of Questions : 8]

SEAT No. :

PA-1235

[Total No. of Pages : 3

[5925]-257

**S.E. (Computer/Artificial Intelligence & Data Science/
Computer Science & Design Engineering)
OBJECT ORIENTED PROGRAMMING
(2019 Pattern) (Semester - III) (210243)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain the polymorphism feature of OOP. What are the different ways to achieve polymorphism in C++ Language? Explain them along with examples. [5]
- b) What is operator overloading? Write a program to overload '+' operator for adding two complex numbers which are object of below complex class. [6]

Class Complex

{

 Private: int real, imag;

};

- c) What is Pure virtual function? Illustrate the use of Pure virtual function. [6]

OR

- Q2)** a) What is runtime polymorphism? How it is achieved in C++. Explain it along with example. [5]
- b) What is function overloading? Write definition of three overloaded functions (add) which will add two integer, float and double numbers respectively. [6]
- c) Explain abstract class concept along with example. [6]

P.T.O.

- Q3)** a) What are various functions used to manipulate file pointers? Explain using example. [7]
- b) What are command line arguments in C++? Write a program to explain the same. [7]
- c) What are fstream, ifstream and ofstream? Illustrate with help of example. [4]

OR

- Q4)** a) Write a program to create file, read and write record into it. Every record contains employee name, id and salary. Store and retrieve atleast 3 data. [7]
- b) What do you mean by file handling? Explain the following functions. [7]
- i) open()
 - ii) get()
 - iii) getline()
- c) Write a program to create files using constructor function. [4]

- Q5)** a) Distinguish between overloaded function and function template with suitable example. [4]
- b) What is an exception specification? Explain using suitable example. [6]
- c) What is generic programming? How it is implemented in C++. [7]

OR

- Q6)** a) Write short note on type name and export key-word. [4]
- b) Explain class template using multiple parameters with help of program. [6]
- c) Explain exception handling mechanism in C++? Explain by program to handle "divide by zero". [7]

- Q7)** a) What is purpose of iterator and algorithm. [4]
b) What is STL? List and explain different types of STL containers. [6]
c) Write a program to implement map in STL. [8]

OR

- Q8)** a) What are major components of STL. [4]
b) State functions of vector STL. Write a program to explain the same. [6]
c) What is container? List the container classes in C++. Explain any one of them using program. [8]



Total No. of Questions : 8]

SEAT No. :

PA-1236

[Total No. of Pages : 2

[5925]-258

S.E. (Computer & Design Engineering)

COMPUTER GRAPHICS

(2019 Pattern) (Semester - III) (210244)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

- Q1) a) Differentiate between Parallel projection and perspective projection. [4]
b) What is transformation and write transformation matrix for : [4]
i) 2-D reflection with respect to line $Y = X$
ii) 3-D rotation about Y-axis
c) Perform 45° rotation of a triangle A(0, 0), B(1, 1) and C(5, 2). Find transformed coordinates after rotation, (i) About origin, (ii) About P (-1, 1). [10]

OR

- Q2) a) What are the types of projection and write in brief about each type of projection. [4]
b) Derive 3D transformation matrix for rotation about a principal axis. [4]
c) A triangle is defined by $\begin{bmatrix} 2 & 4 & 4 \\ 2 & 2 & 4 \end{bmatrix}$. Find transformed coordinates after the following transformation. [10]
i) 90° rotation about the origin.
ii) Reflection about line $X = Y$

- Q3) a) Explain backface detection and removal. [6]
b) Explain and compare point source and diffuse illumination. [5]
c) Compare Gouraud shading and phong shading. [6]

P.T.O.

OR

- Q4)** a) Write short note on Warnock's Algorithm [6]
b) Explain Halftone shading. [5]
c) Explain the following terms with examples: [6]

- i) Color gamut
- ii) Specular Reflection
- iii) Diffuse reflection

- Q5)** a) Write a short note on interpolation and approximation. [4]
b) Explain blending function for B-spline curve. [7]
c) What are fractals? Explain Triadic Koch in detail. [7]

OR

- Q6)** a) Explain the Bezier curve. List its properties. [4]
b) Explain Hilbert's curve with an example. [7]
c) With suitable example write short note on the fractal line. [7]

- Q7)** a) Explain deletion of segment with suitable example. [7]
b) Define Morphing and write the applications of Morphing. [3]
c) Explain architecture of i860. [7]

OR

- Q8)** a) Write a short note on motion specification methods based on : [7]
i) Geometric and kinematics information.
ii) Specification methods based on physical information.
b) Write any three important features of NVIDIA gaming platform. [3]
c) Explain renaming of a segment with suitable example. [7]

◆◆◆

Total No. of Questions : 8]

SEAT No. :

PA-1237

[Total No. of Pages : 2

[5925]-259

S.E. (Computer Engineering)

DIGITAL ELECTRONICS AND LOGIC DESIGN

(2019 Pattern) (Semester - III) (210245)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data, if necessary.

Q1) a) What are sequential circuits? Explain excitation table of JK flipflop. [6]

b) Convert Following Flipflops: [6]

- i) SR to JK
- ii) JK to D

c) What is MOD counter? Design MOD - 24 counter using 7490. [6]

OR

Q2) a) What are sequential circuits? Explain SR flipflop using a suitable example. [6]

b) Convert Following Flipflops: [6]

- i) JK to T
- ii) SR to D

c) Design sequence detector using MS JK flipflop for sequence 1101. [6]

Q3) a) Draw ASM chart for 2-bit UP counter using multiplexer controller method. [6]

b) Draw a block diagram of the PLA device and explain. [6]

c) Implement following Boolean function using PAL [5]

$$F_1 = \sum m(0, 2, 3, 4, 5, 6, 7, 8, 10, 11, 15)$$

$$F_2 = \sum m(1, 2, 8, 12, 13)$$

OR

PTO.

Q4) a) What is an ASM Chart? Design the ASM chart for a 2-bit binary counter having one enable line E such that when: [6]

E = 1 (count enabled) and

E = 0 (counting is disabled).

b) Implement 3 bit binary to gray code converter using PLA. [6]

c) A combinational Circuit is defined by the following function: [5]

$$F_1(A, B, C) = \sum m(0, 1, 3, 7)$$

$$F_2(A, B, C) = \sum m(1, 2, 5, 6)$$

Implement this circuit with PLA.

Q5) a) Explain the operation of TTL NAND gate. [6]

b) Compare TTL and CMOS families and also draw CMOS-NOR Gate. [6]

c) Define the following terms and mention the standard values for TTL logic Family: [6]

i) Noise Margin

ii) Power Dissipation

iii) Propagation Delay

OR

Q6) a) Explain TTL open collector. [6]

b) Draw and explain the circuit diagram of the CMOS Inverter. [6]

c) Draw two input standard TTL NAND gate circuit and explain their operation. [6]

Q7) a) What is Microprocessor? Explain the system bus in brief. [6]

b) Which are various functional units of microprocessors? Explain ALU in brief. [6]

c) How Basic Arithmetic operations are performed using ALU IC 74181? [5]

OR

Q8) a) What is Microprocessor? Explain various operations of the microprocessor. [6]

b) Explain the Memory organization of the microprocessor. [6]

c) Explain the 4-bit Multiplier circuit using ALU and shift registers in brief. [5]



Total No. of Questions : 9]

SEAT No. :

PA-1238

[Total No. of Pages : 7

[5925]-260

S.E. (Computer/I.T./AI&ML)

ENGINEERING MATHEMATICS - III
(2019 Pattern) (Semester - IV) (207003)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Q.1 is compulsory.
- 2) Attempt Q2 or Q3, Q4 or Q5, Q6 or Q7, Q8 or Q9.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Use of electronic pocket calculator is allowed.
- 6) Assume suitable data, if necessary.

Q1) Write the correct option for the following multiple choice questions :

i) $y : 1 \ 2 \ 3$

$x : 1 \ 5 \ 9$

The least square fit of the form $x = ay + b$ to the above data is _____ [2]

- a) $x = 2y - 5$
- b) $x = 4y + 4$
- c) $x = 4y + 1$
- d) $x = 4y - 3$

ii) For two events A and B, $P(A) = \frac{2}{3}$, $P(B) = \frac{3}{8}$ and $P(A \cap B) = \frac{1}{4}$, then the events A and B are _____. [2]

- a) mutually exclusive and independent
- b) not mutually exclusive and not independent
- c) independent, but not mutually exclusive
- d) mutually exclusive, but not independent

P.T.O.

iii) Using Gauss elimination method, the solution of system of equations

$$x + 4y - z = -5, y + \frac{5}{3}z = \frac{7}{3} \text{ and } -13y + 2z = 19 \text{ is } \underline{\hspace{2cm}}. [2]$$

a) $x = \frac{117}{71}, y = -\frac{81}{71}, z = \frac{148}{71}$

b) $x = \frac{71}{117}, y = -\frac{71}{81}, z = \frac{71}{148}$

c) $x = -\frac{117}{71}, y = \frac{81}{71}, z = -\frac{148}{71}$

d) $x = 1, y = 2, z = 0$

iv) If Lagrange's polynomial passes through $\begin{array}{cc|c} x & 0 & 1 \\ y & 1 & 2 \end{array}$ then $\int_0^1 y dx = \underline{\hspace{2cm}}$. [2]

a) $\frac{2}{3}$

b) $\frac{3}{2}$

c) $\frac{1}{2}$

d) 3

v) If $\sum xy = 2638, \bar{x} = 14, \bar{y} = 17, n = 10$, then $\text{cov}(x, y) = \underline{\hspace{2cm}}$. [1]

a) 25.8

b) 23.9

c) 20.5

d) 24.2

- vi) If x_0, x_1 are two initial approximations to the root of $f(x) = 0$, by secant method the next approximation x_2 is given by _____. [1]

a) $x_2 = \frac{x_0 + x_1}{2}$

b) $x_2 = x_1 - \frac{f(x_1)}{f'(x_1)}$

c) $x_2 = x_1 - \frac{(x_1 - x_0)}{(f_1 - f_0)} f_1$

d) $x_2 = x_1 + \frac{(x_1 + x_0)}{(f_1 + f_0)} f_1$

- Q2)** a) The first four moments of a distribution about 4 are $-1.4, 17, -30$ and 108 . Obtain the first four central moments and coefficient of skewness & kurtosis. [5]
- b) Fit a linear curve of the type $y = ax + b$, to following data, [5]

x	10	15	20	25	30
y	0.75	0.935	1.1	1.2	1.3

- c) Find the correlation coefficient for the following data, [5]

Population density	200	500	400	700	800
Death rate	12	18	16	21	10

OR

- Q3)** a) Find coefficient of variability for following data, [5]

C.I.	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Freq. (f)	4	7	8	12	25	18	10

- b) Fit a linear curve $y = ax + b$, by least square method to the data, [5]

x	100	120	140	160	180	200
y	0.9	1.1	1.2	1.4	1.6	1.7

- c) The regression equations are $8x - 10y + 66 = 0$ and $40x - 18y = 214$.
The value of variance of x is 9. Find [5]

- i) the mean values of x and y
- ii) the correlation x and y and
- iii) the standard deviation of y

- Q4)** a) Three factories A, B and C produce light bulbs. 20%, 50% and 30% of the bulbs are available in the market by factories A, B and C respectively. Among these, 2%, 1% and 3% of the bulbs produced by factories A, B and C are defective. A bulb is selected at random in the market and found to be defective. Find the probability that this bulb was produced by factory B. [5]
- b) On an average, 20% of the computers in a firm are virus infected. If 10 computers are chosen at random from this firm, find the probability that at least one computer is virus infected, using Binomial distribution. [5]
- c) The height of a student in a school follows a normal distribution with mean 190 cm and variance 80 cm^2 . Among the 1,000 students from the school, how many are expected to have height above 200 cm? [5]

(Given : $z = 1.118$, $A = 0.3686$)

OR

- Q5)** a) A die is tampered in such a way that the probability of observing an even number is twice as likely to observe an odd number. Find the expected value of the upper most face obtained after rolling the die. [5]
- b) The number of industrial injuries per working week in a factory is known to follow a Poisson distribution with mean 0.5. Find the probability that during a particular week, at least two accidents will take place. [5]
- c) A pea cultivating experiment was performed. 219 round yellow peas, 81 round green peas, 61 wrinkled yellow peas and 31 wrinkled green peas were noted. Theory predicts that these phenotypes should be obtained in the ratios 9:3:3:1. Test the compatibility of the data with theory, using 5% level of significance. (Given : $\chi^2_{\text{tab}} = 7.815$) [5]

- Q6)** a) Obtain the root of the equation $x^3 - 4x - 9 = 0$ that lies between 2 and 3 by Newton-Raphson method correct to four decimal places. [5]
- b) Solve $2x - \cos x - 3 = 0$ by using the method of successive approximations correct of three decimal places. [5]
- c) Solve by Gauss - Seidel method, the system of equations : [5]

$$2x_1 + x_2 + 6x_3 = 9$$

$$8x_1 + 3x_2 + 2x_3 = 13$$

$$x_1 + 5x_2 + x_3 = 7$$

OR

Q7 a) Solve by Gauss elimination method, the system of equations : [5]

$$4x_1 + x_2 + x_3 = 4$$

$$x_1 + 4x_2 - 2x_3 = 4$$

$$3x_1 + 2x_2 - 4x_3 = 6$$

b) Solve by Jacobi's iteration method, the system of equations : [5]

$$20x_1 + x_2 - 2x_3 = 17$$

$$3x_1 + 20x_2 - x_3 = -18$$

$$2x_1 - 3x_2 + 20x_3 = 25$$

c) Find a real root of the equation $x^3 - 2x - 5 = 0$ by the method of false position at the end of fifth iteration. [5]

Q8 a) Using Newton's backward difference formula, find y at x = 4.5 for the following data. [5]

x	1	2	3	4	5
y	3.47	6.92	11.25	16.75	22.94

b) Use Simpson's 3/8th rule, to estimate $\int_1^7 f(x)dx$ from the following data. [5]

x	1	2	3	4	5	6	7
f(x)	81	75	80	83	78	70	60

c) Use Euler's method to solve $\frac{dy}{dx} = x^2 + y$, $y(0) = 1$. Tabulate values of y for $x = 0$ to $x = 0.3$. (Take $h = 0.1$) [5]

OR

Q9) a) Use Runge-Kutta method of 4th order to solve $\frac{dy}{dx} = \frac{y-x}{y+x}$, $y(0)=1$ at $x = 0.2$ with $h = 0.2$. [5]

- b)** Using modified Euler's method, find $y(1.1)$. Given $\frac{dy}{dx} = 2 + \sqrt{xy}$, $y(1)=1$. Take $h = 0.1$. (Two iterations only) [5]
- c)** Determine the value of $y = \sqrt{151}$, using Newton's forward difference formula, from the following data. [5]

	150	152	154	156
$y = \sqrt{x}$	12.247	12.329	12.410	12.490

□□□



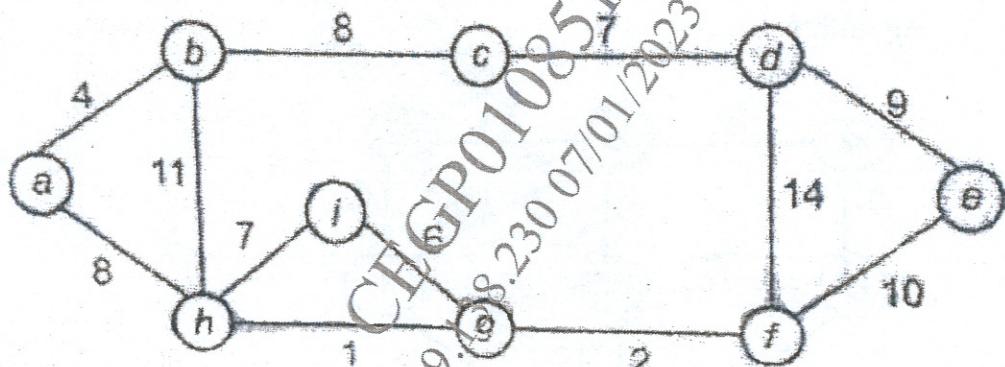
[5925]-261

S.E. (Computer Engineering)
DATA STRUCTURES AND ALGORITHMS
(2019 Pattern) (Semester-IV) (210252)

*Time : 2½ Hours]**[Max. Marks : 70]**Instructions to the candidates:*

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

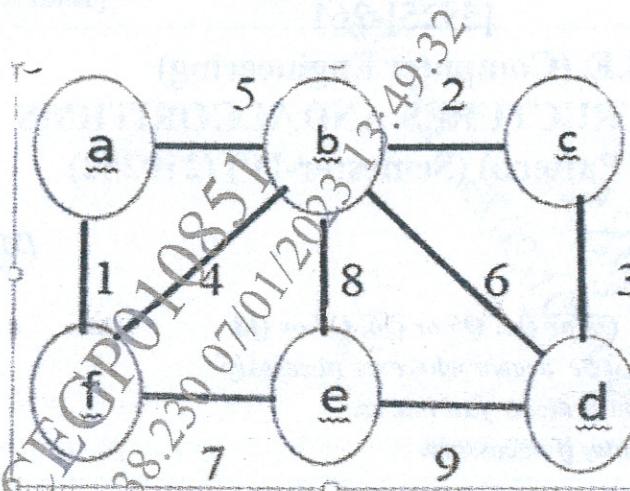
- Q1) a)** Find minimum spanning tree of the following graph using kruskals algorithm. [6]



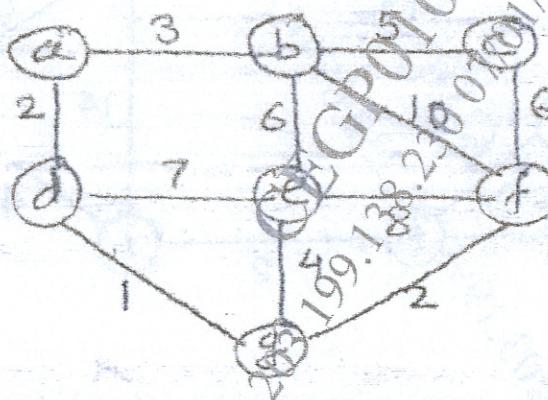
- b)** Write algorithm for Breadth First Traversal of the graph. Also write its complexity. [6]
- c)** Write Kruskal's algorithm for minimum spanning trees and explain with example. [6]

OR

- Q2) a)** Apply Prim's Algorithm to construct Minimum Spanning Tree, for below drawn graph: Starting vertex is 'a'. [6]



- b) Develop pseudo code with one example to traverse a graph using BFS. [6]
 c) Find the shortest path from a to f, in the following graph using Dijkstra's Algorithm. [6]



- Q3) a)** What is OBST? List binary search tree with 3 words (w_1, w_2, w_3) = (do, if, stop) words occurs with probabilities (P_1, P_2, P_3) = (0.4, 0.5, 0.1) find expected access time in each case. [6]
 b) Build AVL tree for given sequence of data. Show balance factor of all nodes and name the rotation used for balancing the tree 40, 60, 80, 50, 45, 47, 44, 42, 75, 46, 41. [6]
 c) Write short notes on:
 i) Red Black tree
 ii) Splay tree [5]

OR

- Q4) a)** Construct OBST for given data using dynamic programming approach.
Explain stepwise. [6]

Index	0	1	2	3
Data	10	20	30	40
Frequency	4	2	6	3

- b) Demonstrate Deletion Operation in AVL with example. [6]
c) Explain following terms w.r.t. height balance tree LL, RR, LR, RL. [5]

- Q5) a)** Construct B-tree of order 4 by inserting the following data one at a time.
20, 10, 30, 15, 12, 40, 50 [6]
- b) Write an algorithm to insert a node in B Tree. [6]
- c) Construct the B+ Tree of order 4 for the following data: 1, 4, 7, 10, 17,
21, 24, 25, 19, 20, 28, 42. [6]

OR

- Q6) a)** Build B+ tree of order 3 for the following:
1, 42, 38, 21, 31, 10, 17, 7, 31, 25, 20, 18. [6]
- b) Write an algorithm to delete a node from B+tree. [6]
- c) Insert the keys to a 5-way B-tree:
3, 7, 9, 23, 45, 1, 5, 14, 25, 24, 13, 11, 08, 19, 04, 31, 35, 56 [6]

- Q7) a)** Write short notes on: [6]
- i) Factors affecting the file organization
 - ii) Indexed sequential files
 - iii) Indexing techniques
- b) Compare sequential indexed sequential and direct access files. [6]
- c) Explain any 4 modes of opening the file in C or C++. [5]

OR

- Q8) a)** Explain following operations carried out on sequential files. [6]
- i) Add
 - ii) Delete
 - iii) Search
- b) Explain any 3 operations carried out on sequential file and its pseudo code. [6]
- c) A file of employees records, has 'employee no' as primary key and the 'department code' and the 'designation code' as the secondary keys. Write a procedure to answer the following query - 'Which employees from systems department are above designation level 4?' [5]



Total No. of Questions : 8]

SEAT No. :

PA-2628

[Total No. of Pages : 2

[5925]-262

S.E. (Computer/AI&DS)

Software Engineering

(2019 Pattern) (Semester - IV) (210253)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data if necessary.

- Q1)** a) Explain object oriented view of component level design with suitable example. [6]
b) Explain FP based estimation technique? [6]
c) What is project scheduling? What are the basic principles of project scheduling? [6]

OR

- Q2)** a) Explain COCOMO Model for project estimation with suitable example. [9]
b) How LOC and FP used during project Estimation? Explain both Estimation techniques with suitable example. [9]

- Q3)** a) Explain guidelines for component level design. [6]
b) Enlist the golden rules of User Interface Design. [6]
c) Explain layered system architecture with neat diagram. [5]

OR

- Q4)** a) Describe notations used for deployment diagram. Describe the importance of Deployment diagram. [9]
b) Explain the following architectural styles with merits/demerits : [8]
i) Data-centered Architecture
ii) Data-flow architecture

P.T.O.

- Q5)** a) What is Risk Identification? What are different categories of Risk? [6]
b) Define software Risk in detail. What are different types of Software Risk? [6]
c) What are the advantages of SCM Repository? Explain functions performed by SCM Repository. [6]
- OR
- Q6)** a) What is Software Configuration Management (SCM) [9]
b) What is RMM? Write short note on it? [9]
- Q7)** a) What are difference between white box testing and black box testing. [6]
b) Explain the software testing life cycle in detail. [6]
c) Explain bottom-up testing with its advantages. [5]
- OR
- Q8)** a) What is system testing? Explain any three types system testing. [9]
b) Write note on Alpha and Beta Testing. [8]

Total No. of Questions : 8]

SEAT No. :

PA-1240

[Total No. of Pages : 2

[5925]-263

S.E. (Computer)

MICROPROCESSOR

(2019 Pattern) (Semester - IV) (210254)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams should be drawn wherever necessary.
- 3) Use of Non-programmable Calculator is allowed.
- 4) Assume suitable data if necessary.

- Q1)** a) Explain the Segment Translation Process with a neat diagram of 80386. [6]
b) Differentiate and explain GDTR, LDTR, and IDTR. [6]
c) Demonstrate General Selector Format in brief. [6]

OR

- Q2)** a) Demonstrate General Descriptor Format available in various descriptor tables. [6]
b) With the necessary diagram, explain the page translation process in 80386. [6]
c) Explain the use of following instructions in detail:
i) LGDT
ii) SIDT
iii) LLDT [6]

- Q3)** a) What is call gate? Explain how it is used in calling functions with higher privilege levels. [6]
b) Explore five aspects of protection applied in segmentation. [6]
c) Explore the need for a protection mechanism in 80386. [5]

OR

P.T.O.

- Q4)** a) Explain the following terminologies. [6]
- CPL
 - DPL
 - RPL
- b) Explain different levels of protection. Describe the rules of protection check? [6]
- c) Elaborate on the concept of combining segment protection and page level protection in 80386. [5]
- Q5)** a) Explore memory management in the Virtual 8086 Mode. [6]
- b) Explain the TSS descriptor of 80386 with a neat diagram. [6]
- c) Explore the role of Task Register in multitasking and the instructions used to modify and read Task Register. [6]
- OR
- Q6)** a) Draw and explain the Task State Segment of 80386. [6]
- b) With the necessary diagram, explain entering and leaving the virtual mode of 80386. [6]
- c) Difference between Real Mode and Virtual 8086 Mode. [6]
- Q7)** a) Explain the following exception conditions with an example: Faults, Traps, and Aborts. [6]
- b) With the help of the necessary diagram, explain the structure of IDT in 80386. [6]
- c) List and elaborate on different applications of microcontrollers. [5]
- OR
- Q8)** a) Differentiate and explain the Interrupt gate and Trap gate descriptor. [6]
- b) How interrupts are handled in protection mode. Explain with the help of a neat diagram. [6]
- c) Differentiate between Microprocessor and Microcontroller. [5]

X X X

Total No. of Questions : 8]

SEAT No. :

PA-1241

[Total No. of Pages : 2

[5925]-264

S.E. (Computer Engineering)

PRINCIPLES OF PROGRAMMING LANGUAGES

(2019 Pattern) (Semester - IV) (210255)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Assume suitable data if necessary.

- Q1) a)** Justify the meaning of each characteristic of Java in the statement "Java is simple, architecture neutral portable, interpreted and robust and secured programming language". [6]
- b)** Write a program in Java to perform the addition of two matrices (multidimensional arrays) and set the diagonal elements of resultant matrix to 0. [6]
- c)** Write a program in Java using switch-case statement to perform addition, subtraction, Multiplication and Division of given two numbers and print the result. [6]

OR

- Q2) a)** Explain in brief below keywords with example in Java. [6]
- i) Final ii) Static iii) This
- b)** Define Constructor. List its different types. Demonstrate with suitable example the different types of constructors used in Java. [6]
- c)** Write a program which receives n integers. Store the integers in an array. Program outputs the number of odd and even numbers present in this array. [6]

- Q3) a)** Define Inheritance and list the advantages. Explain the types of Inheritance in Java with suitable Java code. [9]
- b)** Describe Exception. Write any two examples of exception. Explain keywords try, catch, throw, throws and finally related to exception handling. [8]

OR

P.T.O.

Q4) a) Demonstrate the methods of creating packages and importing them in other java programs with example. Write about the access protection in packages. [9]

b) Explain abstract classes and polymorphism in Java with appropriate java codes. [8]

Q5) a) Write short notes on React JS. Enlist and explain the feature of it. [6]

b) Explain life cycle of Thread model in Java. [6]

c) State the term thread synchronization. Explain how to achieve thread synchronization in Java. [6]

OR

Q6) a) List the features of JavaScript and write a JavaScript program to display Welcome message. [6]

b) Write short note angular JS. List its advantages and disadvantages. [6]

c) Differentiate Multiprocessing and Multi-threading. [6]

Q7) a) Write a program to find the factorial of a given number using LISP. [6]

b) Evaluate the following forms of LISP. [5]

i) (car (cdr '(1 2 3 4 5)))

ii) (car (cdr '(a(b c)d e)))

iii) (car (cdr(cdr '(1 2 3 4 5 6 7 8))))

c) Explain the basic list manipulation in prolog. [6]

OR

Q8) a) Explain the following Equality predicates using suitable example. [6]

i) EQUAL

ii) EQ

iii) EQL

iv) =

b) Comparisons between functional programming and logic programming. [5]

c) Explain the phrases - "Term", "Facts", "Rule", Goals" used in Prolog with example. [6]

