

Total No. of Questions : 4]

SEAT No. :

PA-28

[Total No. of Pages : 2

[5931]-39

**S.E. (Information Technology)**

**(214445): BASICS OF COMPUTER NETWORK**

**(2019 Pattern) (Semester - I)**

*Time : 1 Hour]*

*[Max. Marks : 30*

*Instructions to the candidates :*

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

**Q1)** a) Draw ISO/OSI model and explain functions of following layers : [5]

- i) Physical
- ii) Data link
- iii) Network layer

b) List and explain different types of Transmission Impairment. [5]

c) Encode the following binary stream [1 0 1 0 0 0 1 1 0] into NRZ-L, NRZ-I. [5]

OR

**Q2)** a) Explain different addressing schemes in TCP/IP model. [5]

b) What is mean by Delta Modulation? Explain Distortion in Delta Modulation. [5]

c) Write a short note on Bus topology & Star topology. [5]

*P.T.O.*

- Q3)** a) What is CRC? Generate the CRC code of message 1101011101. Given generator Polynomial  $g(x) = x^3 + x^2 + 1$ . [5]
- b) Explain the working mechanism of [5]
- i) Go back-N ARQ
- ii) Selective Repeat ARQ
- c) What is hamming code? Also find Hamming Code word for following Data word 1001011 using even parity. [5]

OR

- Q4)** a) Explain with example fixed-size framing and variable size framing. [5]
- b) Explain Two dimensional parity check. [5]
- c) Discuss the concept of redundancy in error detection and correction.[5]

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Total No. of Questions : 8]

SEAT No. :

**PA-1246**

[Total No. of Pages : 2

**[5925]-269**

**S.E. (Information Technology)**

**BASICS OF COMPUTER NETWORK**

**(2019 Pattern) (Semester - III) (214445)**

*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) Figures to the right side indicate full marks.
- 4) Use of Calculator is allowed.
- 5) Assume Suitable data if necessary.

**Q1) a)** Define controlled access and list three protocols in this category. Explain any two protocols. **[8]**

b) Write short note with reference to MAC layer and Physical Layer on: **[9]**

- i) Standard Ethernet
- ii) Fast Ethernet
- iii) Gigabit Ethernet

**OR**

**Q2) a)** Write short note on: **[8]**

- i) IEEE 802.3 Standard
- ii) IEEE 802.4 Standard

b) Describe different channelization techniques mentioned below in short: **[9]**

- i) FDMA
- ii) TDMA
- iii) CDMA

**Q3) a)** Explain the operation of NAT with suitable example. **[8]**

b) Compare and Contrast Subnetting, Supernetting. An organization is granted the block 172.16.0.0/18. Design the network and Find how many subnets? Find how many hosts per subnet? What are the valid subnets? What is the broadcast address for last subnet? What is the range of valid hosts in last subnet? **[9]**

**OR**

**P.T.O.**

- Q4) a)** What is the need of IPv6? Explain different types of IPv6 address. [8]
- b)** Explain following terms: [9]
- i) Private IPv4 address
  - ii) Public IPv4 addresses
  - iii) NAT

- Q5) a)** Compare and contrast distance vector routing with link state routing. List out and explain key features of EIGRP that makes it superior to OSPF. [9]
- b)** What is routing? List out and explain different metrics used in various routing protocols. [9]

OR

- Q6) a)** Compare and Contrast Intra Domain and Inter Domain Routing Protocols. List out and explain key features of OSPF that makes it superior to RIP. [9]
- b)** What is BGP? How it avoids count to infinity problem? Explain the difference between internal BGP and external BGP. [9]

- Q7) a)** Explain TCP with its header format. [9]
- b)** What is a Socket? Explain various socket primitives used in client-server interaction with neat diagram for a stream socket. [9]

OR

- Q8) a)** What is silly window syndrome? List different solutions to overcome it. Explain one solution at sender side and receiver side each. [9]
- b)** What do you mean by congestion control in transport layer? What are the different methods to alleviate it? [9]



Total No. of Questions : 4]

SEAT No. :

PA-27

[Total No. of Pages : 2

[5931]-38

**S.E. (Information Technology)**  
**OBJECT ORIENTED PROGRAMMING**  
**(2019 Pattern) (Semester - I) (214444)**

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates:

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

- Q1)** a) Differentiate between object oriented programming and procedural oriented programming. [5]
- b) Model a real-world scenario 'vehicle' class using object oriented paradigm. [5]
- c) Write a short notes on: [5]
- i) Data Abstraction
  - ii) Inheritance

OR

- Q2)** a) Describe the characteristics of object oriented programming. [5]
- b) Write a short notes on: [5]
- i) Polymorphism
  - ii) Data Encapsulation
- c) What are the limitations of procedural oriented programming? [5]

- Q3)** a) Elaborate any two uses of 'this' keyword in object oriented programming. [5]
- b) How is method overloading achieved in object oriented programming? Explain with an example. [5]
- c) Identify classes, objects, and methods for adding two complex numbers. [5]

OR

P.T.O.

- Q4)** a) Write a program demonstrating passing an object as a parameter to a method. [5]
- b) What are the characteristics of static variables and methods? Explain with an example. [5]
- c) Design a class 'student' with suitable instance variables and methods. Create the database of the students and display the records using an array of objects. [5]

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Total No. of Questions : 8]

SEAT No. :

PA-1245

[Total No. of Pages : 2

[5925]-268

**S.E. (Information Technology)**  
**OBJECT ORIENTED PROGRAMMING**  
**(2019 Pattern) (Semester - III) (214444)**

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) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

**Q1)** a) What is Constructor? What are the characteristics of the Constructor?  
Explain Constructor Overloading with an example? [9]

b) Write a short note on : [9]

- i) Garbage collection in Java
- ii) Destructor in C++

OR

**Q2)** a) Design a class 'Complex' with data members for real and imaginary part. Provide default and Parameterized constructors. Write a program in JAVA to perform a **Subtraction** of two complex numbers. [9]

b) Discuss with example Dynamic initialization of object in Java. [9]

**Q3)** a) Define Inheritance. What are the types of Inheritance? How can you inherit a class in Java? [9]

b) What is polymorphism? Explain compile time and run time polymorphism. [8]

OR

**Q4)** a) Differentiate between method overriding and method overloading. Explain method overriding concept with an example. [9]

b) What is interface in java? How to declare an interface, write a syntax? Can we achieve multiple inheritance by using interface? Justify with an example. [8]

P.T.O.



**Q5) a)** What is an exception? Explain the following terms with respect to exception handling: [9]

- i) try
- ii) catch
- iii) throw
- iv) finally

**b)** Write a generic method to count the number of elements in a collection that have a specific properties like odd integers, prime numbers and palindrome. [9]

OR

**Q6) a)** Explain ArrayList class with an example. [9]

**b)** Write a java program to accept and display the month number. Throw number format exception if improper month number is entered. [9]

**Q7) a)** Explain FileInputStream class. Write any four methods of File Input stream class with their syntax. [9]

**b)** Explain following File operations using File class : [8]

- i) Create a File
- ii) Read from a File
- iii) Write to a File
- iv) Close a File

OR

**Q8) a)** Write a short note on . [8]

- i) Iterator
- ii) Singleton

**b)** Implement a program for maintaining a database of student records using Files. Student has Student-id, name, Roll\_no, Class, marks and address. Display the data for few students. [9]

- i) Create Database
- ii) Display Database
- iii) Delete Records
- iv) Update Record
- v) Search Record





Total No. of Questions : 4]

SEAT No. :

PA-429

[Total No. of Pages : 1

[5931]-37

**S.E. (Information Technology)**  
**DATA STRUCTURES AND ALGORITHMS**  
**(2019 Pattern) (Semester - I) (214443)**

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicates full marks.
- 3) Draw well labeled diagram wherever necessary.

- Q1)** a) Explain following Data Structures with examples for each. [6]  
i) Linear & Non-linear ii) Persistent & Ephemeral  
b) Discuss with examples time complexity & space complexity of an algorithm. [6]  
c) Enlist differences between Data & Data Object. [3]

OR

- Q2)** a) In a matrix of order  $5 \times 5$ , having base address 6500, for storing characters, compute the address of element of stored at 4<sup>th</sup> row and 3<sup>rd</sup> column. (Say if the array is alpha [5][5], then find address of alpha [4][3]). Use column-major method. [8]  
b) Discuss how frequency count is used to study time complexity. [4]  
c) Write Sudo code to add an element at near end in singly circular list. [3]

- Q3)** a) Enlist & Explain characteristics of sorting algorithms. [4]  
b) Discuss with examples Quick sort & Merge sort algorithms. [8]  
c) Explain with example difference between linear search & binary search. [3]

OR

- Q4)** a) Demonstrate how Quick sort is performed on following set of no.s 50, 70, 45, 68, 30, 90, 20, 79 [8]  
b) Explain time complexity of following sorting algorithms. [4]  
i) Insertion sort ii) Shell sort  
c) Write sudo code for fibonacci search. [3]



Total No. of Questions : 8]

SEAT No. :

P652

[Total No. of Pages : 4

[5869] - 281

**S.E. (Information Technology)**  
**DISCRETE MATHEMATICS**  
**(2019 Pattern) (Semester - III)**

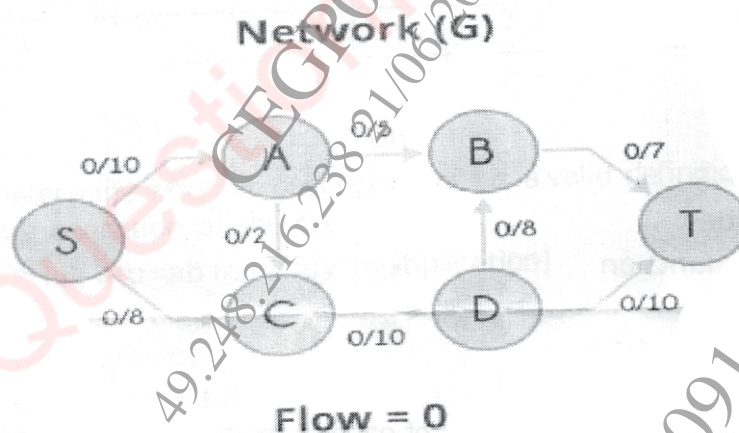
Time : 2½ Hours]

[Max. Marks : 70

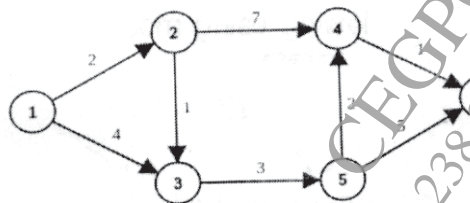
Instructions to the candidates :

- 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) Draw neat diagrams wherever necessary.
- 4) Use of scientific calculators is allowed.
- 5) Assume suitable data if necessary.

- Q1) a) What are various operations on Graph? Explain it in detail? [4]
- b) Find the maximum flow in the given network. [8]



- c) Find the shortest path using Dijkstra's algorithm. [6]



OR

P.T.O.

- Q2) a)** Let 'G' be a connected planar graph with 20 vertices and the degree of each vertex is 3. Find the number of edges and regions in the graph. [6]
- b)** Explain the following types of graphs with the help of examples : [6]
- i) Bipartite Graph
  - ii) Complete Graph
  - iii) Regular Graph
  - iv) Spanning Subgraph
- c)** Find under what conditions  $K_m, n$  the complete bipartite graph will have an Eulerian circuit. [6]

- Q3) a)** Suppose that the relation R on a set is represented by the matrix  $M_R$ . Is R reflexive, symmetric, and/or anti-symmetric? [6]

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

- b)** Find the homogeneous solution for the recurrence relation [6]
- $$A_n - 6a_{n-1} - 11a_{n-2} + 6a_{n-3} \text{ with } a_0 = 2, a_1 = 5, a_2 = 15$$
- c)** Let  $f(x) = x + 2$ ,  $g(x) = x - 2$ ,  $h(x) = 3x$ , for  $x \in R$  where R is the set of real numbers Find i)  $\text{gof}$  ii)  $\text{fog}$  iii)  $\text{fof}$  iv)  $\text{hog}$  v)  $\text{gog}$ . [5]

OR

- Q4) a)** Find Relation Matrix, [6]
- i) If  $A = \{1, 2, 3, 4, 5, 6\}$  and  $a R b$  iff  $a$  divides  $b$  for  $a, b \in A$ .
  - ii)  $R = \{(a, b) / a < b\}$  for  $a, b \in A$ .
- b)** Let  $A = \{1, 2, 3, 4\}$ ,  $B = \{a, b\}$ , and  $R = \{(1, a), (2, a), (3, a), (4, a)\}$ ,  $S = \{(4, a), (4, b), (3, a), (3, b)\}$  [6]

Find

- i)  $A \times B$
  - ii)  $\sim R$
  - iii)  $\sim S$
  - iv)  $\sim R \cup \sim S$
- c)** Describe : [5]
- i) Identity function
  - ii) Composite function
  - iii) Inverse function

- Q5) a)** Find the prime factorization of each of the following integer. [6]  
 i) 6647 ii) 45500  
 iii) 10!
- b) Find integers p and q such that  $51p + 36q = 3$  using Extended Euclidian algorithm. Also find GCD. [6]
- c) Find the values of the following using modular arithmetic. [6]  
 i)  $77 \bmod 9$   
 ii)  $3110 \bmod 13$

OR

- Q6) a)** Solve the following using Fermat's Little theorem. [6]  
 i)  $769 \bmod 23$   
 ii)  $3101 \bmod 13$
- b) Find Euler Totient Function of the following numbers. [6]  
 i) 75 ii) 5488  
 iii) 77
- c) Compute GCD of the following using Euclidean algorithm. [6]  
 i) GCD (831, 366)  
 ii) GCD (2222, 1234)

- Q7) a)** Consider the (2, 6) encoding function e.  $e(00) = 100000$ ,  $e(10) = 101010$ ,  $e(01) = 001110$ ,  $e(11) = 101001$ . Find minimum distance of e. How many errors will e detect? [7]
- b) Let  $R = \{0^\circ, 60^\circ, 120^\circ, 180^\circ, 240^\circ, 300^\circ\}$  and  $*$  = binary operation, so that  $a * b$  is overall angular rotation corresponding to successive rotations by a and then by b. Show that  $(R, *)$  is a Group. [6]
- c) Prove that the following table on relation of elements of set  $G = \{0, 1, 2, 3, 4, 5\}$  multiplication mod 6 is not a group. [4]

	0	1	2	3	4	5
0	0	1	2	3	4	5
1	1	2	3	4	5	0
2	2	3	4	5	0	1
3	3	4	5	0	1	2
4	4	5	0	1	2	0
5	5	0	1	2	3	4

OR

Q8) a) Determine whether description of  $*$  is a valid definition of a binary operation on the set. [6]

i) On  $R$ ,  $a*b = ab$  (ordinary multiplication)

ii) On  $Z$ ,  $a*b = a/b$

iii) On  $Z$ ,  $a*b = ab$

iv) On  $Z$ ,  $a*b = a-b$

v) On  $Z$ ,  $a*b = 2a+b$

vi) On  $R$ ,  $a*b = ab/3$

b)  $S = \{1, 2, 3, 6, 12\}$ , where  $a*b$  is defined as LCM  $(a, b)$ . [7]

Determine whether it is an Abelian Group or not.

c) Define Ring. [4]



Total No. of Questions: 8]

PA-1242

SEAT No. :

[Total No. of Pages : 4

[5925]-265

S.E. (IT)

**DISCRETE MATHEMATICS**  
**(2019 Pattern) (Semester-III) (214441)**

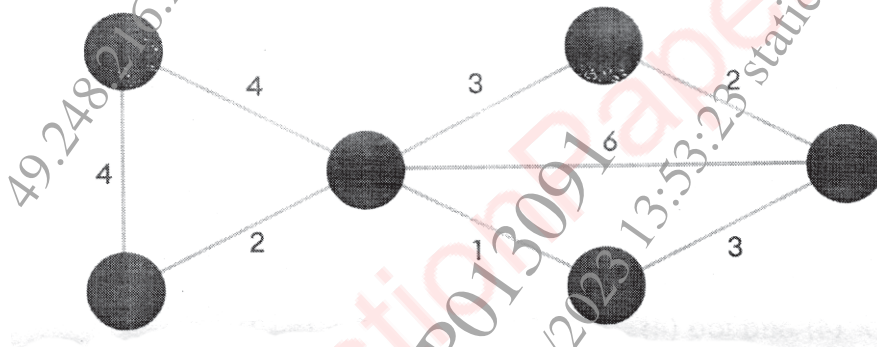
Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

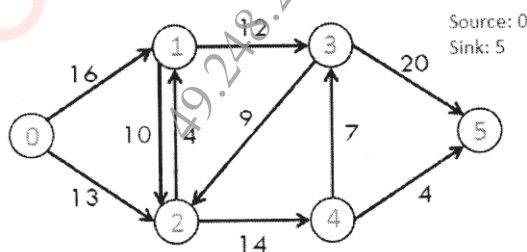
- 1) Answer Q.1, or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Figures to the right indicate full marks.

**Q1) a)** Find the Shortest Path algorithm using Dijkstra's Shortest path algorithm. [6]



b) Construct an optimal tree for the weights 3, 4, 5, 6, 12 Find the weight of the optimal tree. [6]

c) Find the maximum flow for the following transport network. [6]



OR

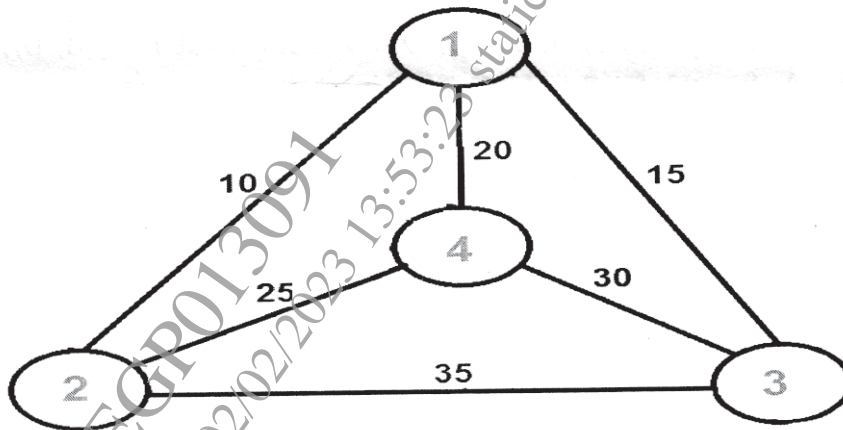
**Q2) a)** Define Following with examples: [6]

- i) rooted tree
- ii) Spanning tree
- iii) Binary Tree

P.T.O.



- b) Use nearest Neighbourhood method to solve Travelling Salesman problem. [6]

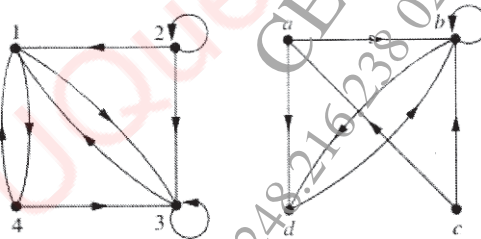


- c) Explain Hamiltonian and Euler path and circuits with example. [6]

Q3) a)  $X = \{2, 3, 6, 12, 24, 36\}$  and  $x \leq y$  iff  $x$  divides  $y$ . Find [6]

- Maximal Element
- Minimal Element
- Draw the graph and its equivalent hasse diagram for divisibility on the set:  $\{2, 3, 6, 12, 24, 36\}$ .

- b) What are the ordered pairs in the relation  $R$  represented by the directed graph shown in below Figures? [6]



- c) Let functions  $f$  and  $g$  be defined by [5]

$$f(X) = 2X + 1, g(X) = X^2 - 2$$

Find

- $\text{gof}(4)$  and  $\text{fog}(4)$
- $\text{gof}(a+2)$  and  $\text{fog}(a+2)$
- $\text{fog}(5)$
- $\text{gof}(a+3)$
- $\text{gof}(a+4)$

OR



- Q4) a)** What is the reflexive closure of the relation  $R = \{(a, b) \mid a < b\}$  on the set of integers and symmetric closure of the relation  $R = \{(a, b) \mid a > b\}$  on the set of positive integers? [6]
- b)** Determine whether the relations for the directed graphs shown in Figure are reflexive, symmetric, antisymmetric, and/or transitive. [6]



- c)** Let  $X = \{a, b, c\}$ . Define  $f: X \rightarrow X$  such that  $f = \{(a, b), (b, a), (c, c)\}$  [5]  
Find  
i)  $f^{-1}$   
ii)  $f^{-1}$  of  
iii)  $f \circ f^{-1}$

- Q5) a)** Solve the congruence  $8x = 13 \pmod{29}$  [6]
- b)** For each pair of integer  $a$  and  $b$ , find integers  $q$  and  $r$  such that  $a = bq + r$  such that  $0 \leq r < |b|$ , where  $a$  is dividend,  $b$  is divisor,  $q$  is quotient and  $r$  is remainder. [8]
- i)  $a = -381$  and  $b = 14$   
ii)  $a = -433$  and  $b = -17$
- c)** Find all positive divisors of [4]
- i)  $256 = 2^8$   
ii)  $392 = 2^3 \cdot 7^2$

OR

- Q6) a)** Which of the following congruence is true? Justify the answer. [6]
- i)  $446 \equiv 278 \pmod{7}$   
ii)  $793 \equiv 682 \pmod{9}$   
iii)  $445 \equiv 536 \pmod{18}$
- b)** Compute GCD of the following using Euclidian algorithm. [6]
- i)  $\text{GCD}(2071, 206)$   
ii)  $\text{GCD}(1276, 244)$
- c)** Using Chinese Remainder Theorem, find the value of  $P$  using following data. [6]
- $p \equiv 2 \pmod{3}$   
 $p \equiv 2 \pmod{5}$   
 $p \equiv 3 \pmod{7}$

**Q7) a)** Let  $R = \{0^\circ, 45^\circ, 90^\circ, 135^\circ, 180^\circ, 225^\circ, 270^\circ, 315^\circ\}$  and  $*$  = binary operation, so that  $a*b$  is overall angular rotation corresponding to successive rotations by  $a$  and then by  $b$ . Show that  $(R, *)$  is a Group. [9]

**b)** Let  $I$  be the set of all integers. For each of the following determine whether  $*$  is an commutative operation or not: [8]

- i)  $a*b = \max(a, b)$
- ii)  $a*b = \min(a+2, b)$
- iii)  $a*b = 2a-2b$
- iv)  $a*b = \min(2a-b, 2b-a)$
- v)  $a*b = \text{LCM}(a, b)$
- vi)  $a*b = a/b$
- vii)  $a*b = \text{power}(a, b)$
- viii)  $a*b = a^2 + 2b + ab$

OR

**Q8) a)** Show that set  $G$  of all numbers of the form  $a+b\sqrt{2}$ ,  $a, b \in I$  forms a group under the operation addition i.e.  $(a+b\sqrt{2}) + (c+d\sqrt{2}) = (a+c) + (b+d)\sqrt{2}$ . [9]

**b)** Determine whether the set together with the binary operation is a semigroup, group a monoid, or neither.

$S = \{1, 2, 5, 10, 20\}$ , where  $a*b$  is defined as  $\text{GCD}(a, b)$  [8]

Total No. of Questions : 4]

SEAT No. :

PA-429

[Total No. of Pages : 1

[5931]-37

**S.E. (Information Technology)**  
**DATA STRUCTURES AND ALGORITHMS**  
**(2019 Pattern) (Semester - I) (214443)**

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicates full marks.
- 3) Draw well labeled diagram wherever necessary.

- Q1)** a) Explain following Data Structures with examples for each. [6]  
i) Linear & Non-linear ii) Persistent & Ephemeral  
b) Discuss with examples time complexity & space complexity of an algorithm. [6]  
c) Enlist differences between Data & Data Object. [3]

OR

- Q2)** a) In a matrix of order  $5 \times 5$ , having base address 6500, for storing characters, compute the address of element of stored at 4<sup>th</sup> row and 3<sup>rd</sup> column. (Say if the array is alpha [5][5], then find address of alpha [4][3]). Use column-major method. [8]  
b) Discuss how frequency count is used to study time complexity. [4]  
c) Write Sudo code to add an element at near end in singly circular list. [3]

- Q3)** a) Enlist & Explain characteristics of sorting algorithms. [4]  
b) Discuss with examples Quick sort & Merge sort algorithms. [8]  
c) Explain with example difference between linear search & binary search. [3]

OR

- Q4)** a) Demonstrate how Quick sort is performed on following set of no.s 50, 70, 45, 68, 30, 90, 20, 79 [8]  
b) Explain time complexitier of following sorting algorithms. [4]  
i) Insertion sort ii) Shell sort  
c) Write sudo code for fibonacci search. [3]

