Total No. of Questions : 8]

SEAT No. :

PB3652

[Total No. of Pages :2

[6261]-60

S.E. (I.T.)

LOGIC DESIGN & COMPUTER ORGANIZATION

(2019 Pattern) (Semester-III) (214442)

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 indicates full marks.***
3) ***Assume suitable data if necessary.***

Q1) a) Differentiate between combinational Circuit and Sequential Circuit. **[6]**

b) Explain in detail the Conversion of D flip-flop to T flip-flop. **[6]**

c) Define Register. Explain various types of shift registers. **[5]**

OR

Q2) a) Draw the pin Configuration of IC 7476 and explain the function of Present and Clear pins. **[6]**

b) What is meant by race around condition? How race around condition can be eliminated? **[6]**

c) Define Modulus of Counter. Design MOD-81 counter using Decade Counter IC 7490. **[5]**

Q3) a) Explain following terms in brief i) ALU Signals ii) ALU Functions iii) ALU Types. **[6]**

b) What are the uses of Registers in a CPU? List typical Registers in a CPU. Write a short note on Flag register. **[6]**

c) What are interrupts? Explain with diagram what steps are carried out when they are present. **[6]**

OR

Q4) a) Write in brief about the Fetch cycle with operations and microinstructions carried out? **[6]**

b) Explain and Design basic structure of Von Neumann architecture. Write the difference between Harvard and Von Neumann architecture. **[6]**

c) Write a short note on following - Address Bus, Data Bus, Control Bus. **[6]**

P.T.O.

Q5) a) What is mean by Machine Instruction? Explain basic format of Machine instruction? What are the basic types of machine instructions? **[6]**

b) What is meant by Multicore architecture? List the typical features of multicore intel core i7. **[6]**

c) What is purpose of Interrupt? What are various types of Interrupts? **[5]**

OR

Q6) a) Explain interrupt handling. **[6]**

b) Give the Taxonomy of Parallel Processor Architectures, with one line explanation of each type. **[6]**

c) Identify the addressing mode in following instructions: **[5]**

i) MOV R1, #0A2DH

ii) MOV R1,R2

iii) MOV R1, [R2]

Q7) a) Along with suitable diagram explain direct cache mapping technique. **[6]**

b) What is DMA? Along with suitable diagram explain how DMA is used for data transfer. **[6]**

c) Explain memory read cycle with timing diagram. **[6]**

OR

Q8) a) Compare : SRAM and DRAM. **[6]**

b) Explain Cache Coherence. **[6]**

c) Whta is Principle of Locality? Explain two types of Localities. **[6]**

Total No. of Questions : 8]

SEAT No. : [ ]

P9134

[Total No. of Pages : 2

[6179]-260

S.E. (Information Technology Engg.)

LDCO : LOGIC DESIGN & COMPUTER ORGANIZATION

(2019 Pattern) (Semester - III) (214442)

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.***

Q1) a) Differentiate between Combinational circuit & Sequential circuits? **[6]**

b) Design flip flop conversion logic to convert J-K flip flop to T flip-flop? **[6]**

c) Design and draw MOD 96 Counter using IC 7490 & explain its operations? **[6]**

OR

Q2) a) Compare Asynchronous counters with Synchronous counters? **[6]**

b) Design flip flop conversion logic to convert S-R Flip Flop to a J-K Flip-Flop? **[6]**

c) Explain the working of 3-bit synchronous counter using J-K flip flop with suitable circuit diagram and state table? **[6]**

Q3) a) Describe with neat diagram Von Neumann Architecture of computer? **[6]**

b) Write a note on multiple bus hierarchies? **[5]**

c) Explain how system bus organization is used for communication between the major components of a computer with neat diagram? **[6]**

OR

P.T.O.

Q4) a) Describe with neat diagram Harvard Architecture of computer? **[6]**

b) Which are the types of ALU? Explain the operations of ALU by using various control signal? **[5]**

c) Explain the Control unit Implementation using Micro-programmed Implementation? **[6]**

Q5) a) Describe instructions with 0, 1, 2 or 3 addresses using suitable example. **[6]**

b) Differentiate between RISC & CISC Architecture. **[6]**

c) Define and explain with suitable diagram and example Instruction Pipelining Architecture of processor. **[6]**

OR

Q6) a) Describe cluster computer architecture with neat diagram. **[6]**

b) What is SMP? Draw suitable diagram of SMP & explain briefly. **[6]**

c) Explain interrupt handling process using IVT and ISR. **[6]**

Q7) a) Write short note on : **[8]**

i) EPROM

ii) EEPROM

b) What is cache coherency problem? Explain four different approaches to prevent cache coherence problem. **[9]**

OR

Q8) a) Explain cache memory operation using multilevel cache organization. **[8]**

b) Explain with neat diagram Signals used to Connect Memory to Processor. **[9]**

Total No. of Questions : 8]

SEAT No. : [ ]

P1537

[Total No. of Pages : 2

[6002]-166
S.E. (I.T.)
LOGIC DESIGN & COMPUTER ORGANIZATION
(2019 Pattern) (Semester - III) (214442)

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 indicate full marks.***

Q1) a) Define the following terms. **[8]**

i) Propagation Delay Time

ii) Setup Time

iii) Hold Time

iv) Maximum Clock Frequency

b) Draw and explain SR flip-flop using NAND gate. **[6]**

c) Convert T flip-flop to D flip-flop. **[4]**

OR

Q2) a) Design MOD-45 counter using IC 7490. **[8]**

b) Draw and explain 4-bit serial-in serial-out shift register using D-FFs. **[6]**

c) Differentiate between Latch and Flip Flop. **[4]**

Q3) a) Draw and explain Single bus organization of CPU? State functions of CPU? **[8]**

b) Explain sequence of events that occur in Fetch cycle symbolically with diagram at each stage. **[9]**

OR

P.T.O.

Q4) a) Draw the block diagram of Hardwired control unit. **[8]**

b) Describe the functions of registers: IR, MBR, MAR, PC, Flag register. **[9]**

Q5) a) What are key characteristics of RISC & CISC. Compare RISC and CISC. **[9]**

b) What is mean by Instruction format? Explain 0-1-2-3 address formats with suitable example? **[9]**

OR

Q6) a) Draw and explain Cluster and Cluster Architectures. **[9]**

b) Explain symmetric multiprocessors(SMP) organization with features. **[9]**

Q7) a) What are the different algorithms and techniques used in managing cache memory. **[8]**

b) Explain Interrupt Driven I/O with a diagram. **[9]**

OR

Q8) a) Draw & explain memory hierarchy structure? What is mean by a Principle of Locality. **[9]**

b) Explain the memory write cycle with help of suitable timing diagram. **[8]**

Total No. of Questions : 8] **SEAT No. :**

PA-1243 **[Total No. of Pages : 2**

[5925]-266
S.E. (IT)
LOGIC DESIGN & COMPUTER ORGANIZATION
(2019 Pattern) (Semester - III) (214442)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Attempt Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain with a diagram, the conversion of J-K flip flop to D flip flop. **[9]**

b) Differentiate between Latch & flip-flop w.r.t. definition, operation, diagram of applications etc. **[9]**

OR

Q2) a) Design 3-bit synchronous down - counter using MS JK flip flop (IC 7476). (Pin numbers are not required) Draw only logic diagram. **[9]**

b) What is a shift register? State the types of shift registers with applications of each. **[9]**

Q3) a) Explain in brief, various functional units of a computer system with a block diagram showing interconnection between them. **[9]**

b) Write a short note on: PC, MAR, MBR, TR. **[8]**

OR

Q4) a) What is the function of control unit in a CPU? Draw block diagram of Hardwived control unit & explain its operation, pros & cons. **[9]**

b) Explain and draw basic structure of Harvard architecture. State the differences between Harvard and Von Neu mann architecture. **[8]**

Q5) a) What is meant by addressing mode? Explain all addressing modes with examples. **[9]**

b) Differentiate between RISC & CISC architecture. **[9]**

OR

P.T.O.

Q6) a) Explain instruction pipelining w.r.t. operation and speed up formula, achieved by pipelining. **[9]**

b) Explain interrupt w.r.t. its purpose, types. Describe step by step, the interrup handling procedure of microprocessors. **[9]**

Q7) a) Explain with examples the various cache replacement policies. Describe various cache write policies. **[9]**

b) Explain programmed controlled I/O with the help of flow chart. **[8]**

OR

Q8) a) Along with suitable diagram, explain set associative cache mapping technique. **[9]**

b) Explain memory read cycle with the help of suitable timing diagram. **[8]**

Total No. of Questions : 8]

SEAT No. : ____

P-9136

[Total No. of Pages : 2

[6179]-262

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 indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) What is a constructor? Explain the Default constructor with an example. **[6]**

b) Create a Bookshop inventory class. Use appropriate constructors for Bookshop Management. **[6]**

c) Can we overload the constructor? Explain with Example. **[6]**

OR

Q2) a) Explain the Parameterized constructor and Copy constructor with an example. **[6]**

b) What is garbage collection? Explain the finalize () method in detail. **[6]**

c) What is a destructor? Differentiate between Constructor and Destructor. **[6]**

Q3) a) What is inheritance? Explain different types of Inheritance. **[6]**

b) What is an interface in Java? What is the difference between interface and abstract class? **[5]**

c) What is polymorphism? What are the different types of polymorphism? Explain with an example. **[6]**

OR

P.T.O.

Q4) a) Design and develop inheritance for a given case study, identify objects and relationships and implement inheritance wherever applicable, Employee class has Emp_name, Emp_id, Address, Mail_id and Mobile_noas members. Inherit the classes: Programmer, Team Lead, Assistant Project Manager and Project Manager from the employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10% of BP as HRA, 12% of BP as PF, and 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary. **[9]**

b) Explain the concept of Method Overloading and method overriding with examples. **[8]**

Q5) a) What is the Exception exception-handling mechanism in Java? Write a java program to handle the Divide by zero exception. **[8]**

b) Explain user-defined exception with an example. **[5]**

c) Explain Collection classes in detail. **[5]**

OR

Q6) a) What is a generic method? Explain with a suitable example. **[6]**

b) Explain the use of finally in exception handling with an example. **[4]**

c) Write a program Java to handle Array Index Out of Bounds Exception and Null Pointer Exception with the program. **[8]**

Q7) a) Define the term Stream. Explain various stream classes. **[8]**

b) Design a Java program for employee management with following operations - **[9]**

i) Create file

ii) Write data into file

iii) Read data from file. Consider Name, employee id and department as attributes of employee.

OR

Q8) a) Which are different types of Design patterns? **[6]**

b) Explain the Iterator Pattern and its advantages in detail. **[6]**

c) Explain the Adapter pattern and its advantages in detail. **[5]**

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Total No. of Questions : 8]

SEAT No. : ____

PB-3654

[Total No. of Pages : 2

[6261]-62
S.E. (I.T.)
Object Oriented Programming
(2019 Pattern) (Semester - III) (214444)

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 diagram must be drawn wherever necessary***
2) ***Figures to the right side indicate full marks.***
3) ***Assume suitable data if necessary.***

Q1) a) Write a short note on 'Symbolic Constants' in Java. **[9]**

b) Discuss Constructor Overloading with suitable code. **[9]**

OR

Q2) a) How are objects initialized dynamically? Explain with an example. **[9]**

b) What is garbage collection in OOP? Explain finalize() method in Java. **[9]**

Q3) a) Define a class 'shape' with abstract method compute_area(). Derive the classes 'circle' and 'rectangle' from 'shape' class. Calculate the area of circle and rectangle using Dynamic Binding. Use appropriate instance variables and methods whenever necessary. **[9]**

b) Discuss diamond problem in detail? How it can be solved? **[8]**

OR

Q4) a) Design a class 'person1' with instance variables 'name' and 'age'. Derive a class 'person2' from 'person1' class with instance variable 'gender'.Derive a class 'employee' from 'person2' class with instance variable 'address'. Create a database of the 3 employees. Use the appropriate methods to accept and display the data. **[9]**

b) Define Polymorphism? Differentiate between Compile Time Polymorphism and Run Time Polymorphism with an example. **[8]**

P.T.O.

Q5) a) Can we throw an exception explicitly or manually? If 'yes', justify your answer with an example. **[9]**

b) What is Generic Programming? Discuss any four methods of LinkedList class with their syntax. **[9]**

OR

Q6) a) Differentiate between an array and ArrayList class. Explain following methods of ArrayList class. **[9]**

i) add()

ii) get()

iii) remove()

b) Implement a program which handle ArrayIndex Out of Bound Exception **[9]**

Q7) a) What is a Design Pattern? Write a short note on 'Iterator' design pattern. **[9]**

b) How do you write to a file and read from a file using FileWriter and FileReader class, respectively? **[8]**

OR

Q8) a) How are input/output exceptions handled in File Handling? Explain with an example **[9]**

b) Is it possible to concatenate two or more files and save them in a different file? If 'yes', justify your answer with an example. **[8]**

Total No. of Questions : 8]

SEAT No. : [ ]

P1539

[Total No. of Pages : 2

[6002]-168
S.E. (I.T.)
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 necesary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume Suitable data if necesary.***

Q1) a) Consider the definition of 'complex' class as below. **[9]**

```
public class complex
{
private int real, img;
 public complex ()
{
   //constructor 1
}
public complex (int real, int img)
{
   //constructor 2
}
public complex (complex c)
{
   // constructor 3
 }
}
```

Re-write the class 'Complex' as:

i) Define the constructor 1 so that the private member variables are initialized to 0.

ii) Define the constructor 2 so that the private member variable real and img is initialized according to the value of the parameter.

iii) Define the constructors 3, where copy one object to another.

b) With suitable code segments illustrate various uses of 'final' keyword. **[9]**

OR

P.T.O.

Q2) a) What are the characteristics of Destructor? How is Destructor declared in OOP? Demonstrate with an example. **[9]**

b) Write a program which demonstrate constructor with default arguments. **[9]**

Q3) a) Discuss diamond problem in detail? How it can be solved? **[9]**

b) Enlist the benefits and costs of Inheritances. **[8]**

OR

Q4) a) How parameterized constructors get executed in multilevel inheritance? Explain with an example? **[9]**

b) Define polymorphism? What are the types of Polymorphism? How can be run time polymorphism achieved in OOP? **[8]**

Q5) a) Define exception. What are its types? Discuss exception handling mechanism in detail. **[9]**

b) What is Generic programming? Discuss any four methods of ArrayList class with their syntax. **[9]**

OR

Q6) a) Is there any difference between throw and throws in exception handling in Java? If 'yes', justify your answer. **[9]**

b) How basic mathematical set operations union, intersection, and subset are performed using set interface? **[9]**

Q7) a) What is a design pattern? Write a short note on 'Singleton' design pattern. **[9]**

b) Write program to handle primitive data types in file handling. **[8]**

OR

Q8) a) How do you write to a file and read from a file using File Writer and FileReader class, respectively? **[8]**

b) What are the advantages of design patterns? Explain 'Adaptor' design pattern in detail. **[9]**

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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) ***Figurest 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

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Total No. of Questions : 8]

SEAT No. :

PB3653

[Total No. of Pages : 4

[6261]-61
S.E. (I.T.)
DATA STRUCTURES AND ALGORITHMS
(2019 Pattern) (Semester - III) (214443)

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 and Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Imagine we have two empty stacks of integers, S1 and S2. Draw a picture of each stack after the following operations: **[6]**

i) S1. Push (3);
ii) S1. Push (5);
iii) S1. Push (7);
iv) S1. Push (9);
v) S1. Push (11);
vi) S1. Push (13);
vii) while (! Emptystack (S1))
{
X = S1. Pop ();
X = S1. Pop ();
S2. Push (X);
}

b) Clearly indicate the content of stack during conversion of given infix expression to prefix.

A^B*C–D+E/F/(G+H) **[6]**

c) Write a C++ pseudocode algorithm for the following operation of simple queue using linked representation. **[6]**

i) enqueue ()
ii) dequeue()
iii) print_Queue()

OR

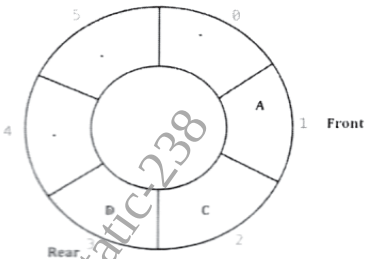
P.T.O.

Q2) a) If the values of A, B, C, and D are 2, 3, 4, and 5 respectively. Calculate the value of the following prefix expression and clearly indicate the content of stack. **(Consider '_' as a minus sign)** **[6]**

i) + – * A B C D

ii) – * A + B C D

b) Consider the following **circular queue of characters of size 6.** "_" denotes an empty queue location. Initial queue configuration is Front = 1, Rear = 3 and having letters as shown below. **[6]**



i) F is added to the queue

ii) Two letters are deleted

iii) K, L, M are added to the queue

iv) R is added to the queue

v) Two letters are deleted

vi) S is added to the queue

vii) Two letters are deleted

Show the queue content of queue with Front and Rear as the above options take place.

c) What is double ended queue? Mention Types of double ended queue. Explain enqueue and dequeue operations of double ended queue. **[6]**

Q3) a) Create a binary tree from given preorder and inorder traversal. **Show all intermediate steps.** **[6]**

Preorder : G B Q A C K F P D E R H

Inorder : Q B K C F A G P E D H R

b) Write the C++ pseudocode algorithm for creating expression tree from postfix expression. **[6]**

c) Construct an inorder threaded binary search tree for the following set of elements. **[5]**

100, 50, 200, 300, 20, 150, 70, 180, 120, 30

Show all steps.

OR

Q4) a) Write C++ pseudocode algorithm for preorder traversal of threaded binary tree. **[6]**

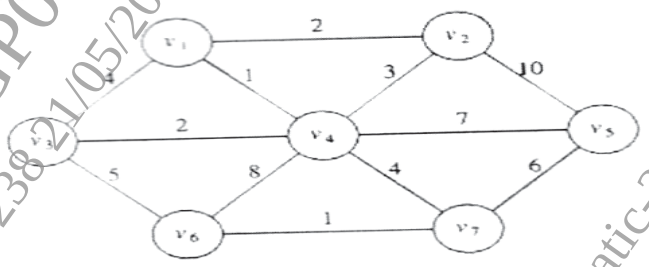
b) Draw the expression tree for the given postfix expression. Clearly indicate the content of stack. Write the inorder and preorder traversal of the concern tree. **[6]**

A B C * + E * F +

c) Explain the following terms with respect to tree. **[5]**

i) Root
ii) Leaf node
iii) Siblings
iv) Degree of a node
v) Degree of tree

Q5) a) Find the minimum spanning tree using Prim's algorithm for the following graph. **[6]**



b) Obtain an AVL tree by inserting one data element at a time in the following sequence: **[7]**

50, 55, 60, 15, 10, 40, 20, 45, 30, 70, 80.

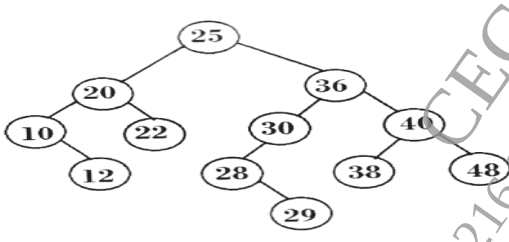
Label the rotations appropriately at each stage

c) Write short note on OBST. **[5]**

OR

Q6) a) Write an application of Topological sorting with suitable example. **[6]**

b) For a given tree, Identify whether it is AVL tree or not? If it is not an AVL tree, convert it into balanced AVL tree. After conversion, insert node 15 in the tree. Delete node 20 from the tree. After insertion and deletion operation, if the tree is imbalanced, make it balanced AVL tree. **[7]**



c) Construct Heap to Sort given values in ascending order using MAXheap sort, 5, 3, 17, 10, 84, 19, 22. **[5]**

(Note : Make a use of Heapify)

Q7) a) Differentiate between sequential file and direct access file. **[6]**

b) Write a pseudo code to perform the following operations on Sequential file : **[6]**

i) Insert record

ii) Delete record

c) What are the characteristics of good hash function? List different techniques to resolve collision in hash table and explain any one with suitable example. **[5]**

OR

Q8) a) Explain the Index sequential file organization with advantages and disadvantage. **[6]**

b) Explain Linear probing with and without replacement with suitable examples. **[6]**

c) What is File? Differentiate between text file and binary file. **[5]**

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Total No. of Questions : 8]

SEAT No. : ____

P9135

[Total No. of Pages : 3

[6179]-261

S.E. (Information Technology Engg.)

DATA STRUCTURES & ALGORITHMS

(2019 Pattern) (Semester - III) (214443)

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.***

Q1) a) Explain stack data structure as an ADT and Discuss briefly applications of stack. **[6]**

b) Write sudo code for insert and delete operations of linear queue. **[5]**

c) Discuss the types of priority queue with their applications. **[5]**

OR

Q2) a) Convert the following infix expressions to postfix using stack. Clearly indicate the contents of stack. **[6]**

i) $(A+B)*C-D*F+C$

ii) $(A-5)*(B+C-D*E)/F$

b) Write sudo code for insert & delete operations of circular queue. **[8]**

c) Enlist applications of Queue data structures. **[2]**

Q3) a) Explain importance of threaded binary tree and Discuss inorder threaded binary tree with example. **[6]**

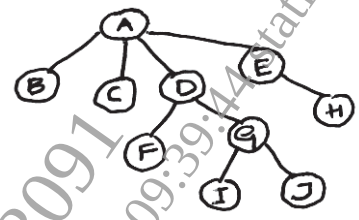
b) Write sudo code for deleting a node in BST considering all scenarios. **[8]**

c) Discuss with the help of example, the significance of height of tree and depth of a tree. **[4]**

OR

P.T.O.

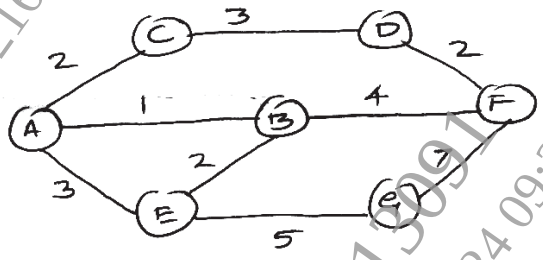
Q4) a) Enlist the difference between a general tree & binary tree. Convert the given general tree to binary tree and write down the steps required for the same. **[8]**



b) Write sudo code for creating a BST of N-nodes. **[6]**

c) Explain with the help of example, threaded binary tree traversals. **[4]**

Q5) a) For the given graph show step-wise representation of MST using Kruskal's algorithm. **[6]**

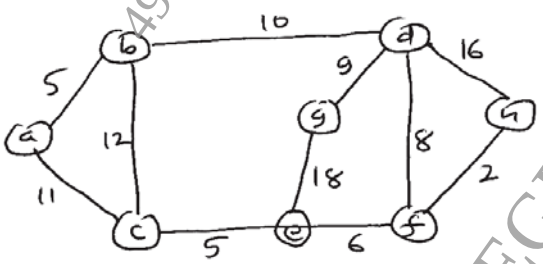


b) Construct an AVL search tree by inserting the following elements in the order of their occurence. Show the balance factor and type of rotation at each stage. **[8]**

c) Enlist and discuss applications of Heap. **[4]**

OR

Q6) a) Find the MST using Prin's algorithm for the following graph. Also write algorithm for the same. **[8]**



b) Which data structures supports to perform sorting using heap data structure. Explain it to sort it in ascending order. 1, 12, 9, 5, 6, 10. **[8]**

c) What is the time-complexity of Prin's algorithm & Kruskal's algorithm. **[2]**

Q7) a) Explain why file opening nodes are important while opening any file. Explain the use of following file-opening nodes. **[8]**

i) ios : : app

ii) ios : : ate

iii) ios : : in

b) For a given set of values : **[10]**

9, 45, 13, 59, 12, 75, 88, 11, 105, 46

Create a hash table and resolve collison using chaining and without replacement.

OR

Q8) a) Write sudo code to perform following operations on sequential file: **[8]**

i) Create and display

ii) Insert a record

b) What is hashing? Explain various hash collision resolution techniques. **[8]**

c) What is the time complexity of a deleting a record from indexed sequential file. **[2]**

✈ ✈ ✈

Total No. of Questions : 8]

SEAT No. :

P1538

[Total No. of Pages : 3

[6002]-167
S.E. (IT)
DATA STRUCTURES & ALGORITHMS
(2019 Pattern) (Semester - III) (214443)

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) ***Figures to the right indicate full marks.***

Q1) a) Define stack as an ADT. Use this stack to swap two no.s (Write Sudo Code). **[6]**

b) Discuss the merits of circular queue over linear queue and write sudo code for over flow and under flow conditions of circular queue. **[8]**

c) Discuss the time complexity of removing an item from priority queue if sequential memory organization is used. **[4]**

OR

Q2) a) Contrast between the characteristics of stack & queue data structures.**[4]**

b) Convert the following infix expressions to postfix and show the contents of stack for each operation.

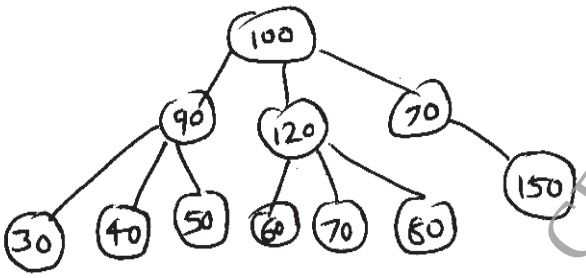
i) p * (X/Y * Z – Q/(A+B)).

ii) A + B $ (M-N)/D ($ for power operation). **[8]**

c) Explain with example the significance of priority queue over simple queue. **[6]**

Q3) a) Discuss the merits & demerits of implementing threaded binary tree. **[6]**

b) Describe the characteristics of a general tree. Convert the following general tree into binary tree. **[8]**



c) Discuss the time complexities of inserting & deleting a node from BST.**[4]**

OR

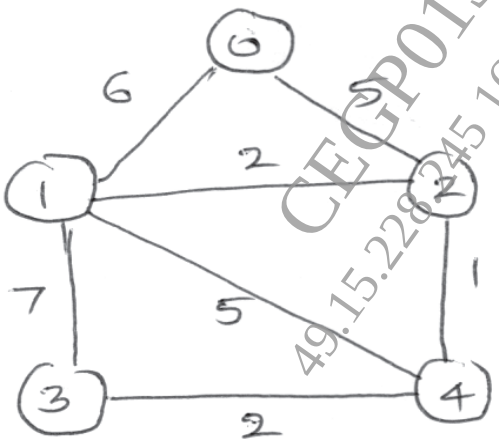
P.T.O.

Q4) a) Discuss the applications of Binary search tree & expression tree. **[4]**

b) Write sudo code for non-recursive inorder tree traversal of binary tree. **[6]**

c) For the following binary tree, show (draw) threaded binary tree (inorder).

Q5) a) Write sudo code of Kruskal's algorithm for creating a MST. Demonstrate with steps for the following graph MST using same algorithm. **[9]**



b) Discuss with example, what is AVL & time complexity to insert a node in an AVL. **[8]**

OR

Q6) a) Explain the time complexity of heap sort & sort the following No.s in ascending order using heap sort. 5, 3, 17, 10, 84, 19, 22. **[9]**

b) Contrast between the approaches of finding MST using prim's algorithm & Kruskal's algorithm. Discuss the time complexities of both algorithms. **[8]**

Q7) a) Explain prototype of the following function in C++ with examples. **[8]**

i) Seekg

ii) Seekp

iii) tellg

iv) tellp

b) Enlist characteristics of a good hash function. Create a hash table for the following set of integers, taking modulus function as hash function (h(k)=k%10).

29, 50, 28, 19, 17, 15, 18, 14, 38.

Demonstrate Chaining with replacement. **[9]**

OR

Q8) a) Write sudo codes to perform following operations on index sequential file. **[8]**

i) inserting a record.

ii) updating a given record.

b) Discuss with examples at least three types of hashing functions, clearly mentioning the advantages & disadvantages of each. **[9]**

✡ ✡ ✡

Total No. of Questions : 8]

SEAT No. :

P654

[Total No. of Pages : 2

[5869] - 283
S.E. (Information Technology)
DATA STRUCTURES & ALGORITHMS
(2019 Pattern) (Semeser - III) (214443)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1, or Q.2, Q.3 or Q.4, Q.5or 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) Convert the following infix expressions to prefix expressions using stack data structure.

i) A+B*C^D-E/F

ii) ((A+B)*C-(D-E))^(F+G) **[9]**

b) Implement Priority queue using linked representation and mention the time complexity of operations. **[9]**

OR

Q2) a) Write sudo code for converting a given infix expression to postfix expression and apply the algorithm to convert (a+b)*c to postfix. **[9]**

b) Write a code for singly linked list creation, insert and Display and mention the time complexity of operations. **[9]**

Q3) a) Suppose the following sequence lists the nodes of a binary tree in preorder and inorder respectively. **[9]**

Preorder - G B Q A C K F P D E R H

Inorder - Q B K C F A G P E D H R

Construct a binary tree from the given traversals

b) Write a note non-recursive function to delete a node in the BST. **[8]**

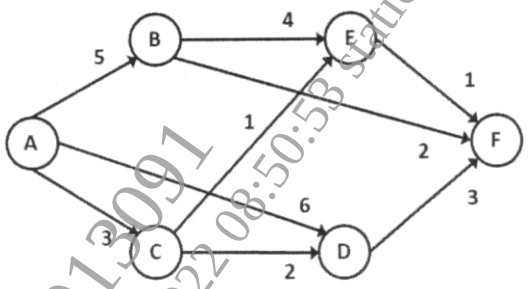
OR

Q4) a) Explain the difference between array representation and linked representation of binary tree. Justify your answer using suitable example of each. **[9]**

b) What are the advantages and disadvantages of TBT? Write a algorithm to implement Inorder Traversal of Inorder TBT. **[8]**

P.T.O.

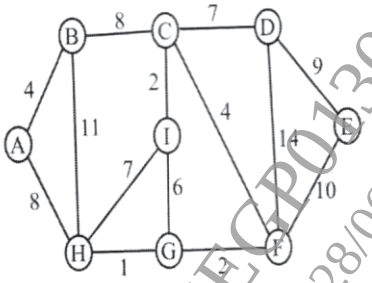
Q5) a) For the given graph, construct the Adjacency Matrix and Adjacency List. Discuss the limitation(s) of Adjacency Matrix. **[9]**



b) What is topological Sorting? Illustrate with an example how topological sorting is performed. List any two applications where topological sorting can be used. **[9]**

OR

Q6) a) What is the cost of the MST? Construct a minimum spanning tree for the given graph using Prim's Algorithm. List applications where MST is required. **[9]**



b) Illustrate with examples the Reheap up and Reheap down operations w.r.t. heaps. List any three applications of Heap. **[9]**

Q7) a) Explain basic concept of Hash table? Define Hash table? Write characteristics of good hash function. **[9]**

b) Write Comparison of different file organizations (sequential, index sequential and Direct Access) **[8]**

OR

Q8) a) Explain with example hash functions. **[9]**

b) Explain Concept of File? Write all File types and explain file organization. **[8]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. : [ ]

PA-1244

[Total No. of Pages : 3

[5925]-267

S.E. (Information Technology)

DATA STRUCTURES & ALGORITHMS

(2019 Pattern) (Semester - III) (214443)

Time : 2½ Hours] ***[Max. Marks :70***

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Discuss how a two-way stack can be developed using array and write sudo code for Push, Pop and display operations. **[9]**

b) Write a code for doubly linked list creation, insert and Display and mention the time complexity of operations. **[9]**

OR

Q2) a) Convert the following infix expressions to postfix expressions using stack data structure. 1) A+B*C^D-E/F 2) ((A+B)*C-(D-E))^(F+G)**[9]**

b) Write a sudo code for Queue implementation using array . Perform the following operations: 1) Queue Full 2) Queue Empty 3) equeue 4) dqueue **[9]**

Q3) a) Construct a binary tree from the given traversals

Pre-order: * + a – b c /– d e – + f g h In-order : a + b – c * d – e/f + g – h **[9]**

b) What is a Binary Tree? Explain the following operations on Binary Tree i) Inserting a node in to BT ii) Deletion a node from BT **[8]**

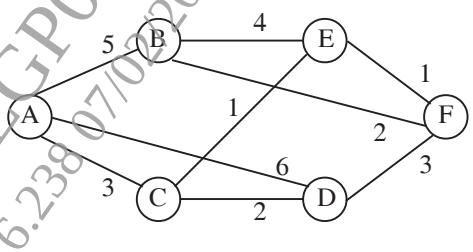
OR

Q4) a) What is the use of threaded binary free? Give the node structure required for a threaded binary tree. Write pseudo code to find in-order successor of any node X in a threaded binary tree. **[9]**

P.T.O.

b) Write a pseudo code to implement binary search tree for performing following operations : i) Display - Mirror image ii) Display - Minimum value iii) Display average value iv) Display leaf nodes **[8]**

Q5) a) Define Minimum Spanning Tree. Compare Prim's and Kruskal's Algorithm. Construct a minimum spanning tree for the given graph using Kruskal's Algorithm. What is the cost of the MST? **[9]**



b) Given the following Adjacency matrix, construct the graph and traverse it in Breadth first order starting at vertex 'F'. **[9]**

	A	**B**	**C**	**D**	**E**	**F**
A	0	3	7	2	4	0
B	3	0	9	0	0	10
C	7	9	0	1	0	0
D	2	0	1	0	5	8
E	4	0	0	5	0	6
F	0	10	0	8	6	0

OR

Q6) a) Construct an Optimal Binary Search Tree for the following data :

N=4, Key Set = {C, E, M}, {p1, p2, p3} = {0.1, 0.2, 0.15},{q0, q1, q2, q3} = {0.15, 0.05, 0.3, 0.05}. What is the cost of the OBST? **[9]**

b) Define AVL Tree. Illustrate with example the various types of rotations that are performed to balance the binary tree. **[9]**

Q7) a) Explain with example hash functions? **[9]**

b) Write short note on closed hashing and Open addressing. **[8]**

OR

Q8) a) Explain chaining with replacement and chaining without replacement in hashing? **[9]**

b) Write Comparison of different file organizations (sequential, index sequential and Direct Access) **[8]**

Total No. of Questions : 8]

SEAT No. :

P-9133

[Total No. of Pages : 4

[6179]-259A

S.E. (Information Technology/A.I. & M.L. Engineering)

DISCRETE MATHEMATICS

(2019 Pattern) (Semester - III) (214441/218541)

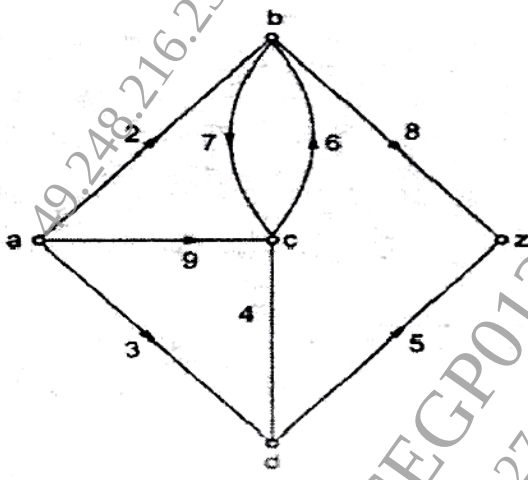
Time : 2½ Hours] *[Max. Marks : 70*

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) Draw the complement of the following graphs. **[6]**

b) Using the labeling procedure, find the maximum flow in the following transport network. **[6]**



c) What is the Prefix Code? Which of the following codes are prefix codes? Justify your answer. **[6]**

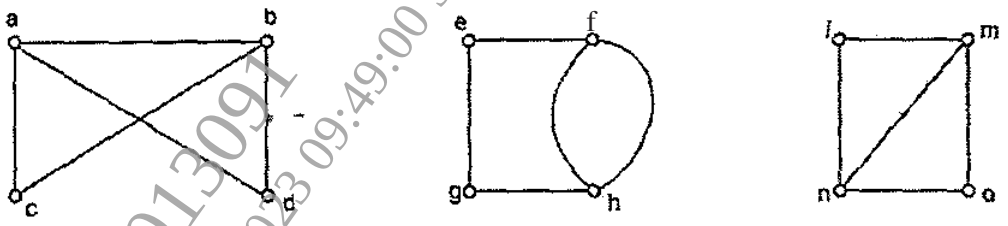
i) a : 0 ,e : 1, t : 01, s : 001

ii) a : 101, e : 11, t : 001, s : 011, n : 010

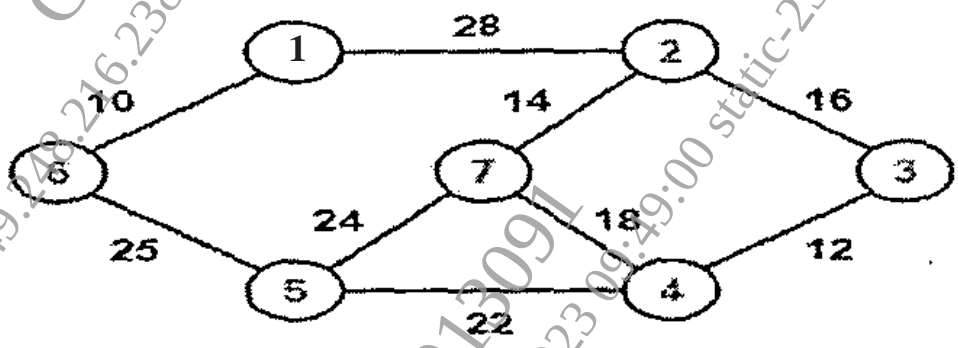
P.T.O.

OR

Q2) a) Determine whether the following graphs are isomorphic to each other. Justify your answer. **[6]**



b) Find the minimum spanning tree and weight of it for the given graph using Prim's algorthm. **[6]**



c) Suppose that sumeone starts a chain letter. Each person who receives the letter is asked to send it on to four other people. Some people do this, but others do not send any letters. How many people have seen the letter, including the first person, if no one receives more than one letter and if the chain letter ends after there have been 100 people who read it but did not send it out? How many people sent out the letter? **[6]**

Q3) a) What is Function? Given a relation R = {(1, 4), (2, 2), (3, 10), (4, 8), (5, 6)} and check whether the following relations R1, R2, R3 & R4 are functios or not. **[6]**

R1 = {(1, 4), (2, 4), (3, 4), (4, 4), (5, 4)}

R2 = {(1, 2), (2, 4), (2, 10), (3, 8), (4, 6), (5, 4)}

R3 = {(1, 6), (2, 2), (4, 4), (5, 10)}

R4 = {(1, 6), (2, 2), (3, 2), (4, 4), (5, 10)}

b) Solve the following recurrence relation. **[6]**

$a_n = 5n_{n-1} - 6a_{n-2}$ where $a_0 = 2$ and $a_1 = 5$.

c) Show that 7 colors are used to paint 50 bicycles, then at least 8 bicycles will be of the same color. **[5]**

OR

Q4) a) Find the transitive closure by using Warshall's algorithm for the given relation as : **[6]**

R = {(1, 1), (1, 4), (2, 1), (2, 2), (3, 3), (4, 4)}

b) Define POSET. Let A is set of factors of positive integer m and relation is divisibility on A. i.e. R = {(x, y)| x, y ∈ A, x divides y}. **[6]**

For m = 45. Draw Hasse Diagram.

c) Given $f(x) = x^2 + 3$ and $g(x) = 3x - 2$. Find f(5), g(3), gof(x) and fog(x). **[5]**

Q5) a) Which of the following congruences is true? Justify your answer. **[6]**

i) $556 \equiv 1296 \pmod{10}$

ii) $1655 \equiv 935 \pmod{11}$

iii) $448 \equiv 784 \pmod{56}$

b) Compute GCD of the following numbers using Euclidean Algorithm. **[6]**

i) GCD (765, 150)

ii) GCD (343, 1554)

c) Using Chinese Remainder Theorem, find the value of P using following data. **[6]**

$P \equiv 2 \pmod{5}$

$P \equiv 5 \pmod{7}$

OR

Q6) a) Find multiplicative inverse of 15 mod 26 using Extended Euclidean Algorithm. **[6]**

b) Find the Euler's totient function of the following numbers. **[6]**

i) 37

ii) 35

iii) 15

c) What is a Mersenne prime number? Which of the following numbers is the Mersenne Prime number? 71, 31, 255, 8191, 7. **[6]**

Q7) a) Let S = {1, 2, 3, 6, 12}, where a*b is defined as LCM (a, b) over set S. Determine whether it is a semigroup, group, or Abelian Group or neither. **[6]**

b) Consider the set A = {1, 3, 5, 7, 9, ...} i.e. a set of odd positive integers. Determine whether A is closed under : **[6]**

i) a*b = a+b

ii) a*b = a–b

iii) a*b = a.b (Multiplication)

iv) a*b = power (a, b)

v) a*b = 2(a + b)

vi) a*b = min (1, a, b)

c) Consider the (2, 6) encoding function e. e(00) = 000000, **[5]**

e(10) = 101010

e(01) = 011110, e(11) = 111000

Find the minimum distance of e.

OR

Q8) a) Show that $(Z_6, +)$ is an Abelian Group. **[6]**

b) Explain Ring with an example. **[6]**

c) Prove that Hamming Distance d(x, y) = 0 iff x = y where x and y are codewords. **[5]**

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Total No. of Questions : 8] **SEAT No. :**

P1596 **[Total No. of Pages : 5**

[6002]-226

S.E. (Information Technology) (Artificial Intelligence & Machine Learning)

DISCRETE MATHEMATICS

(214441, 218541) (2019 Pattern) (Semester - III)

Time : 2½ Hours] ***[Max. Marks : 70***

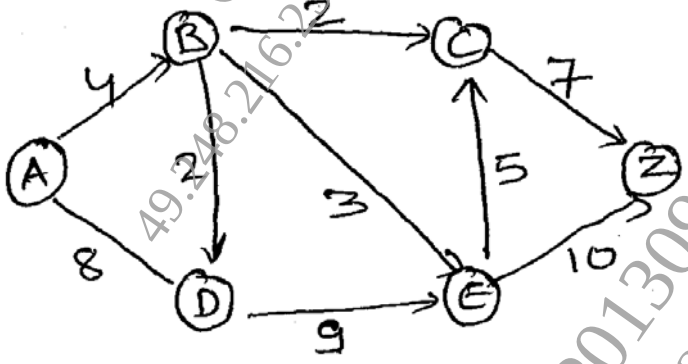
Instructions to the candidates:

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) ***Figures to the right indicate fill marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Show that the maximum number of edges in a simple graph with n vertices is n.(n-1)/2. **[5]**

b) Construct an optimal tree for the weights 3,5, 9, 18, 30, 40, 55. Find the weight of the optimal tree. **[6]**

c) Using the labelling procedure, find the max flow for the following transport network. **[6]**

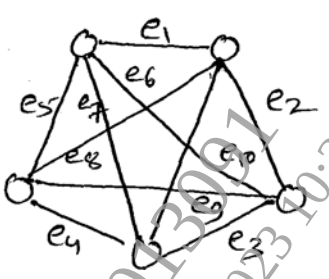


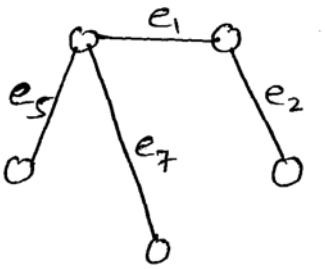
OR

Q2) a) Determine the number of edges in a graph with 7 nodes, 2 of degree 4, 2 of degree 3 and 3 of degree 2. Draw one such graph. **[5]**

P.T.O.

b) Find the fundamental system of cutsets and fundamental system of the circuit for graph, G with respect to the spanning tree, T. **[6]**





c) Find the chromatic number with the help of graph coloring for: **[6]**

i) K6 (complete graph with 6 vertices)

ii) Any complete bipartite graph.

iii) C7 (cyclic graph with 7 vertices).

Q3) a) Consider these relations on the set of integers : **[6]**

R1 = {(a, b) | a ≤ b};

R2 = {(a, b) | a > b};

R3 = {(a, b) | a = b or a = –b};

R4 = {(a, b) | a = b};

R5 = {(a, b) | a = b + 1};

R6 = {(a, b) | a + b ≤ 3};

Which are symmetric and which are antisymmetric?

b) Functions, *f*, *g* & *h* are defined on the set X = {1, 2, 3} as **[6]**

f = {(1, 3), (2, 1), (3, 2)}

g = {(1, 2), (2.3), (3, 1)}

h = {(1, 2), (2, 1), (3, 3)}

i) Find *fog* and gofs Are they equals?

ii) Find *fogoh* and *fohog*.

c) If A = {a,b,c,d} and R = {(a,b),(c,d),(c,c),(d,a),(a,a),(b,b),(d,d)}is a relation on A. Draw a digraph R and $\bar{R}$. **[6]**

OR

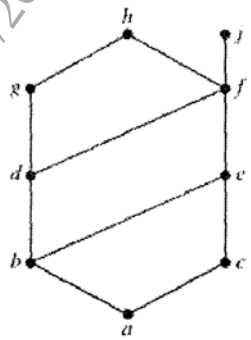
Q4) a) Let A = B be the set of real numbers **[6]**

$f : a \text{ –} > $ given by $f(x) = 2x^3 – 1$

g : B – > A given by $g(y) = 3\sqrt{\frac{1}{2}y + \frac{1}{2}}$

Show that *f* is a bijection between A and B and g is a bijection between B and A.

b) **[6]**



i) Find the lower and upper bounds of the subsets {a, b, c}, {j, h}, and {a, c, d, f } in the post with the Hasse diagram shown in Figure?

ii) Find the greatest lower bound and the least upper bound of {b, d, g}, if they exist, in the post shown in Figure?

c) Solve the following recurrence relation **[6]**

$a_r – 3a_{r–1} = 2 \quad , \quad r > = 1, a_0 = 1$

Q5) a) Using Euclidean Algorithm find GCD of 268 & 884. **[6]**

b) Using Fermat's Theorem and Fermat's Euler Theorem solve the following: **[6]**

i) 7^121 mod 4

ii) 11^100 mod 17

c) Find the multiplicative Inverse of 37 mod 26 using Extended Euclidean Algorithm. **[6]**

OR

Q6) a) Using the Chinese Remainder Theorem, find the value of P using the following data. **[8]**

P = 1 mod 2

P = 2 mod 3

P = 3 mod 5

b) State and explain Fermat - Euler's Theorem with example. **[4]**

c) Find the Totient function of the following numbers : **[6]**

i) 75

ii) 143

iii) 108

Q7) a) Let G = {even, odd) and binary operation $\oplus$ be define as, **[6]**

$\oplus$	even	odd
even	even	odd
odd	odd	even

Show that (G, $\oplus$) is a group

b) Define the following terms with an example : **[6]**

i) Monoid

ii) Group

iii) Abelian group

iv) Ring

c) Find the hamming distance between code words of: C = {(0000), (0101), (1011), (0111), (1111)}

Rewrite the message by adding an even parity check bit and odd parity check bit. **[5]**

OR

Q8) a) Consider the (2,6) encoding function e. e(00)=100000, e(10)=101010 e(01)=001 110, e(11)=101001 **[6]**

i) Find the minimum distance of e

ii) How many errors will e detect?

b) Let I be the set of all integers. For each of the following determine whether * is an associative 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 = LCM(a,b)

vi) a*b = a/b

vii) a*b = power(a,b)

viii) $a*b = a^2 + 2b + ab$

c) Define field with an example. **[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)

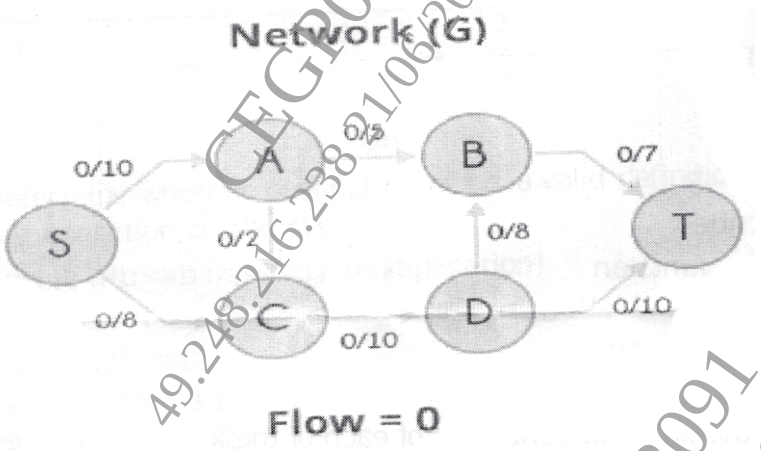
Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

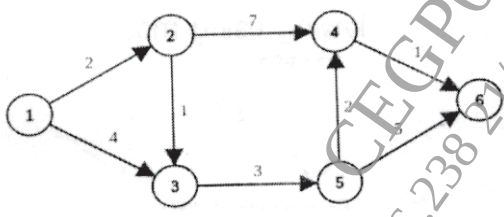
1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagrams wherever necessary.***
4) ***Use of scientific calculators is allowed.***
5) ***Assume suitable data if necessary.***

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 Dijikstra'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 Km, 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]**

$A_n - 6\ a_{n-1} - 11\ a_{n-2} + 6a_{n-3}$ with $a_0 = 2$, $a_1 = 5$, $a_2 = 15$

c) Let $f(x) = x + 2$, $g(x) = x\text{-}2$, $h(x) = 3x$, for $x \in R$ where R is the set of real numbers Find i) gof ii) fog iii) fof iv) hog v) 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 ε A.

ii) R = {$(a, b)/a < b$} for a, b ε 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 × B ii) ~ R

iii) ~ S iv) ~ R ∪ ~ 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 mod 9

ii) 3110 mod 13

OR

Q6) a) Solve the following using Fermat's Little theorem. **[6]**

i) 769 mod 23

ii) 3101 mod 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, **[7]**
e(10) = 101010
e(01) = 001110, e(11) = 101001
Find minimum distance of e.
How many errors will e detect?

b) Let R = {0°, 60°, 120°, 180°, 240°, 300°} 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]

SEAT No. : [ ]

PA-1242

[Total No. of Pages : 4

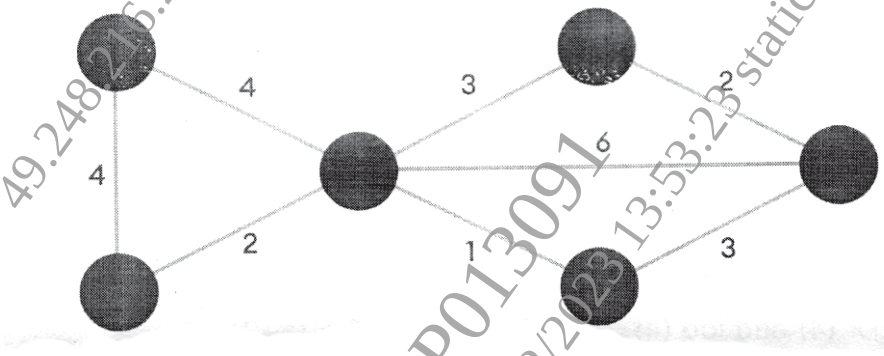
[5925]-265
S.E. (IT)
DISCRETE MATHEMATICS
(2019 Pattern) (Semester-III) (214441)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

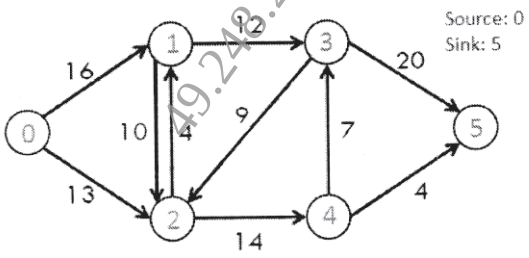
1) ***Answer Q.1, or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Figures to the right indicate full marks.***

Q1) a) Find the Shortest Path algorithm using Dijikstra'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]**



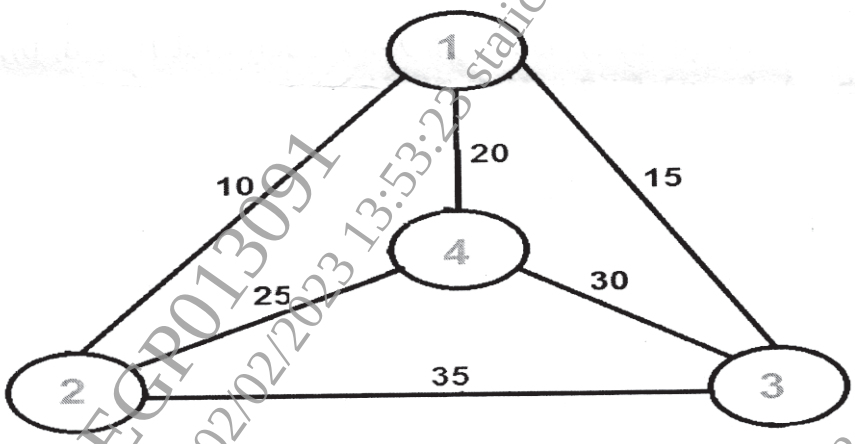
OR

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]**

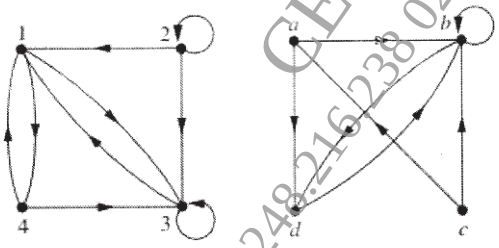
Q3) a) X = {2, 3, 6, 12, 24, 36} and x<=y iff x divides y. Find **[6]**

i) Maximal Element

ii) Minimal Element

iii) 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

i) gof (4) and fog (4)

ii) gof (a+2) and fog (a+2)

iii) fog (5)

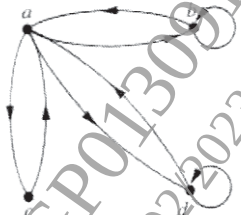
iv) gof (a+3)

v) gof (a+4)

OR

Q4) a) What is the reflexive closure of the relation R = {(a, b) | a<b} on the set of integers and symmetric closure of the relation R = {(a,b) | 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->X such that f ={(a,b), (b, a), (c, c)} **[5]**
Find
i) f^{-1}
ii) f^{-1} of
iii) fof^{-1}

Q5) a) Solve the congruence 8x = 13mod 29 **[6]**

b) For each pair of integer a and b, find integers q and r such that a = bq + r such that 0 <= 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 = 28
ii) 392 = 23. 72

OR

Q6) a) Which of the following congruence is true? Justify the answer. **[6]**
i) 446 ≡ 278 (mod 7)
ii) 793 ≡ 682 (mod9)
iii) 445 ≡ 536 (mod 18)

b) Compute GCD of the following using Euclidian algorithm. **[6]**
i) GCD (2071, 206)
ii) GCD (1276, 244)

c) Using Chinese Remainder Theorem, find the value of P using following data. **[6]**
p=2 mod 3
p=2 mod 5
p=3 mod 7

Q7) a) Let R = {0o, 45o, 90o, 135o, 180o, 225o, 270o, 315o} 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 l 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= LCM (a,b)
vi) a*b=a/b
vii) a*b=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 √ 2, a, b ∈l forms a group under the operation addition i.e.(a+b √ 2) + (c+√ d 2) = (a+c) + (b+d) √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 GCD (a,b) **[8]**

Total No. of Questions : 8]

SEAT No. : ____

P-1540

[Total No. of Pages : 2

[6002]-169
S.E. (Information Technology)
BASIC OF COMPUTER NETWORK
(2019 Pattern) (Semester - III) (214445)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Answer Question 1 or 2, 3 or 4, 5 or 6 and 7or 8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume Suitable data, if necessary.***

Q1) a) Discuss CSMA/CD in details. **[9]**

b) Explain Reservation, Polling & Token passing. **[9]**

OR

Q2) a) Write short note on IEEE 802.4(Token Bus) and IEEE 802.5(Token Ring). **[9]**

b) Discuss CSMA/CA random access technique. How collision avoidance is achieved in the same? **[9]**

Q3) a) Explain Subnetting and Supernetting with example. **[9]**

b) Describe Packet format of IPv6 in detail with suitable diagram. **[8]**

OR

Q4) a) Explain Network Address Translation with suitable diagram. **[9]**

b) Discuss in detail fragmentation in terms of IPv4. **[8]**

Q5) a) Explain Interdomain and Intradomain routing protocol in detail. **[9]**

b) Discuss EIGRP protocol in detail. **[9]**

OR

Q6) a) Explain RIP message format in detail. **[9]**

b) Discuss Distance Vector Routing protocol in detail. **[9]**

P.T.O.

Q7) a) Explain three way handshake algorithm for TCP connection establishment. **[9]**

b) What is congestion Control? Explain Leaky bucket algorithm. **[8]**

OR

Q8) a) What is Socket? List & explain the socket primitives in client side & server side TCP connection. **[9]**

b) Compare TCP and UDP Header with suitable diagram. **[8]**

▽▽▽▽

Total No. of Questions : 8] **SEAT No. :**

P9137 **[Total No. of Pages : 2**

[6179]-263
S.E. (Information Technology)
BASICS OF COMPUTER NETWORKS
(2019 Pattern) (Semester - III) (214445)

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 indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain the various controlled access methods. **[6]**

b) Draw & Explain each Field of MAC frame format of IEEE 802.3 **[6]**

c) Compare TDMA & CDMA with neat Diagram. **[6]**

OR

Q2) a) Explain the following physical layer implementations in standard Ethernet: **[6]**

i) 10 Base 5

ii) 10 Base T

iii) 10 Base F

b) Write short notes on: **[6]**

i) IEEE 802.4 (Token Bus)

ii) IEEE 802.5 (Token Ring)

c) Discuss CSMA/CA & CSMA/CD. Also comment on the efficiency of each. **[6]**

Q3) a) Explain network layer services with example. **[6]**

b) Calculate the following for a network address 192.168, 1.0/27 **[6]**

i) Number of valid subnets

ii) Number of actual hosts per subnet

iii) Network and broadcast address for each subnet

c) Compare between IPv4 and IPv6. **[5]**

OR

P.T.O.

Q4) a) For class C IP address 8 bits is used for subnet. Each subnet has atleast 60 nodes, so calculate subnet mask. **[6]**

b) Explain the Concept of Subnetting and Supernetting. **[6]**

c) Explain NAT & CIDR with neat Diagram. **[5]**

Q5) a) Explain Bellman-Ford Algorithm with help of example. Also write advantages & Disadvantages of Bellman-Ford Algorithm. **[6]**

b) Compare and contrast the advertisement used by RIP and OSPF routing protocols. **[6]**

c) Explain Message format of RIPVI & RIPV2. **[6]**

OR

Q6) a) Discuss the advantages and disadvantages of OSPF and BGP routing algorithms. **[6]**

b) Explain Optimally Principle with help of example. **[6]**

c) Compare Non Adaptive & Adaptive Routing. **[6]**

Q7) a) Explain how to achieve reliability at transport layer. **[6]**

b) Explain the leaky bucket and token bucket algorithm in detail. **[6]**

c) Explain Three Way Handshake algorithm for TCP connection establishment. **[5]**

OR

Q8) a) What is a socket? Explain the various socket primitives and types of socket with Example. **[6]**

b) Discuss flow control and congestion control mechanisms in TCP. **[6]**

c) Compare: TCP & UDP. **[5]**

◀▶ ◀▶ ◀▶

Total No. of Questions : 8]

SEAT No. : [ ]

PB3655

[Total No. of Pages :2

[6261]-63

S.E. (Information Technology)

BASICS OF COMPUTER NETWORK

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

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) Explain FDMA, TDMA & CDMA with neat diagram. **[9]**

b) Draw and Explain MAC Frame Format of 802.3. **[9]**

OR

Q2) a) Discuss CSMA/CA random access technique. How collision avoidance is achieved in the same? **[9]**

b) Write short note on IEEE 802.4(Token Bus) and IEEE 802.5(Token Ring). **[9]**

Q3) a) Discuss Network Layer Services. Illustrate IPv4 addresses with respect to classess. **[9]**

b) Explain Classful and Classless Addressing with example. **[8]**

OR

Q4) a) Describe Subnetting and Supernetting with example. **[9]**

b) Explain in detail fragmentation in terms of IPv4. **[8]**

P.T.O.

Q5) a) Discuss Distance Vector Routing protocol in detail. **[9]**

b) Explain EIGRP protocol in detail. **[9]**

OR

Q6) a) Discuss OSPF protocol in detail. **[9]**

b) Explain Link State Routing protocol in detail. **[9]**

Q7) a) What is congestion Control? Explain leaky bucket algorithm. **[9]**

b) Explain the use of different timers in TCP. **[8]**

OR

Q8) a) Explain various socket primitives used in connection oriented client server approach. **[9]**

b) Discuss with neat diagram TCP header format. **[8]**

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]**