Total No. of Questions—**8**] [Total No. of Printed Pages—**6**

Seat No.	

[5057]-2069

S.E. (Information Technology) (First Semester)

EXAMINATION, 2016

DISCRETE STRUCTURES

(2015 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer 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**.

(*ii*) Neat diagrams must be drawn wherever necessary.

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

(*iv*) Use of calculator is allowed.

(*v*) Assume suitable data, if necessary.

1. (*a*) Prove the statement is true using mathematical induction : [6]

$n^3 + 2n$ is divisible by 3 for all $n >= 1$

(*b*) A bag contains 3 red and 5 black balls and second bag contains 6 red and 4 black balls. A ball is drawn from each bag. Find the probability that : [6]

(*i*) both are red

(*ii*) both are black

(*iii*) 1 is red and 1 is black.

P.T.O.

Or

2. (*a*) Among 130 students, 60 study mathematics, 51 study physics and 30 study both mathematics and physics. Out of 54 students studying chemistry, 26 study mathematics, 21 study physics and 12 study both mathematics and physics. All the students studying neither mathematics nor physics are studying biology : [6]

(*i*) Find how many are studying Biology ?

(*ii*) How many not studying chemistry are studying mathematics but not physics ?

(*iii*) How many students are studying neither mathematics nor physics nor chemistry ?

(*b*) The probability that a contractor will get a plumbing contract is 2/3 and the probability that he will not get electric contract is 5/9. If the probability of getting at least one contract is 4/5. What is the probability that he will get both the contracts ? [6]

3. (*a*) Find the transitive closure of R by Warshall's algorithm where A = {1, 2, 3, 4, 5, 6} and R = $\{(x, y) \mid |x - y| = 2\}$ and draw it digraph. [6]

(*b*) Use Dijkstra's algorithm to find the shortest path from a to z : [6]

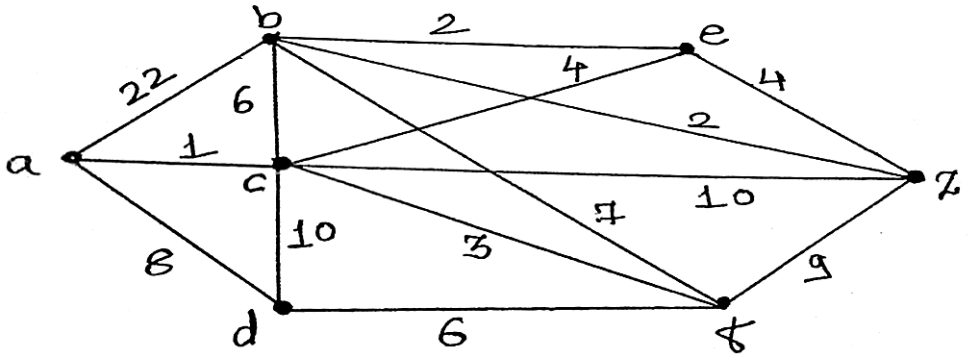


Fig. 1

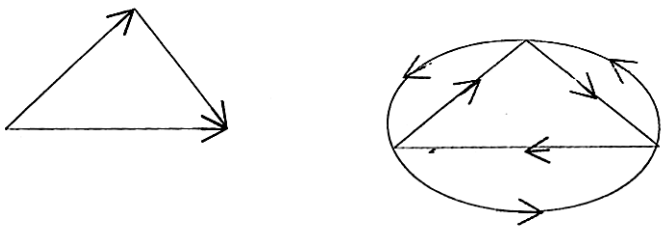
Or

4. (*a*) What is recurrence relation ? Solve the following recurrence relation : [6]

$a_r - 4a_{r-1} + 4a_{r-2} = 0$ given that $a_0 = 1$ and $a_1 = 6$

(*b*) (*i*) What is complement of k_n and k_{mn} ? [4]

(*ii*) Is each of the following graphs strongly connected ? [2]



5. (*a*) A secondary storage media contains information of files with different formats. The frequency of different types of files is as follows :

Exe(20), bin(75), bat(20), jpeg(85), dat(51), doc(32), sys(26), c(19), cpp(25), bmp(30), avi(24), prj(29), lst(35), zip(37).

Using Huffman algorithm, find optimal tree and its prefix codes. [7]

(*b*) Find minimum spanning tree for the graph given below using Prim's algorithm. [6]

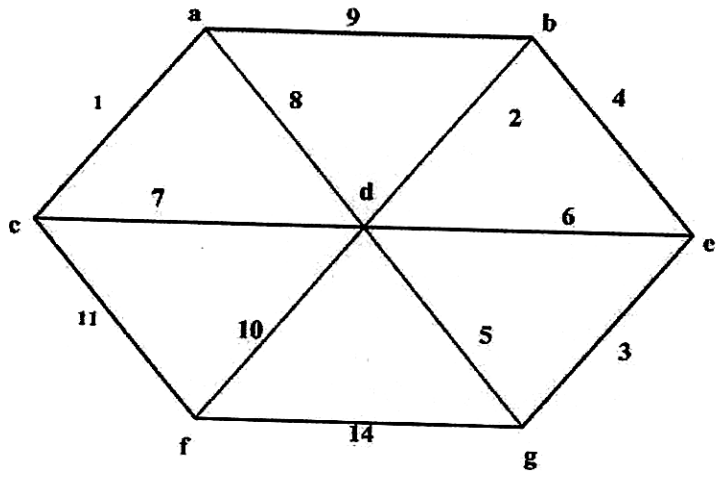


Fig. 2

Or

6. (*a*) Determine the preorder, postorder and inorder traversal of the following binary tree shown in Fig. 3 : [7]

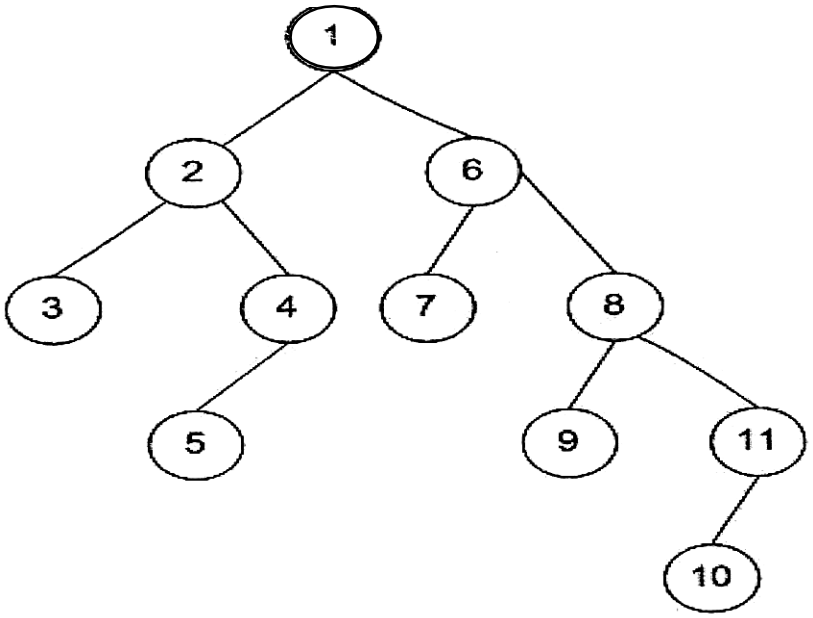


Fig. 3

(*b*) Find minimum spanning tree for the graph given in Fig. 2 using Kruskal's algorithm. [6]

7. (*a*) What is hamming distance ? Find hamming distance between code words of : [6]

c = {(0 0 0 0), (0 1 0 1), (1 0 1 1), (0 1 1 1)}

Rewrite the message by adding even parity check bit.

(*b*) Define the following terms with suitable example : [7]

(*i*) Group

(*ii*) Subgroup

(*iii*) Ring

(*iv*) Monoid.

Or

8. (*a*) Let Z be the set of integers :

(*i*) Show that the operation * on Z defined by $a * b = a + b + 1$ for all $a, b \in Z$ satisfies the closure property, associative law and the commutative law.

(*ii*) Find the identity element

(*iii*) Define inverse. What is the inverse of an integer a ? [6]

(*b*) Define each of the following : [7]

(*i*) Homomorphism of group

(*ii*) Isomorphism of group

(*iii*) Semigroup

(*iv*) Abelian group

Also show that <Z6, + > is abelian group.

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5057]-2061

S.E. (Information Technology) (First Semester)

EXAMINATION, 2016

COMPUTER ORGANIZATION AND ARCHITECTURE

(2015 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Attempt Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** and Q. **7** or Q. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

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

(*iv*) Assume suitable data, if necessary.

1. (*a*) Describe the computer performance parameters such as CPU time, CPI, MIPS, MFLOPS, Benchmark and Amdahl's law. [6]

(*b*) Explain any *four* addressing modes with suitable diagrams. [6]

Or

2. (*a*) Multiply 0111 by 0011 using booth's algorithm. [6]

P.T.O.

Or

(*a*) Perform the division using non-restoring method 15/2.

(*b*) Explain instruction cycle states of a processor with suitable diagram. [6]

3. (*a*) Explain sequence of events that occur in Fetch Cycle symbolically with diagrams at each stage. [7]

(*b*) Explain need of cache memory and direct mapping cache organization technique. [6]

Or

4. (*a*) Explain control unit and its functions along with block diagram. [7]

(*b*) How virtual memory is managed using paging and TLB ? [6]

5. (*a*) Explain MIPS pipeline with appropriate pipeline registers between each pipeline stage. [6]

(*b*) Describe in brief any *one* pipline hazard. [6]

Or

6. (*a*) Explain events of Execute cycle of MIPS Pipeline. [6]

(*b*) Explain basic performance issues in Pipelining. [6]

7. (*a*) Write about Flynn's Taxonomy for Multiple Processor Organizations. [6]

(*b*) Explain Symmetric Multiprocessor (SMP) Organization with features. [7]

Or

8. (*a*) Explain benefits of clustering and its configurations. [7]

(*b*) What is Multicore Computers and explain hardware performance issues of same. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5057]-2062

S.E. (Information Technology) (First Semester)

EXAMINATION, 2016

DIGITAL ELECTRONICS AND LOGIC DESIGN

(2015 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** and Q. **7** or Q. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

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

(*iv*) Assume suitable data, if necessary.

1. (*a*) Do the following conversions : [6]

(*i*) $(27.125)_{10} = (?)_2$

(*ii*) $(3A.2F)_{16} = (?)_{10}$

(*iii*) $(1101.0011)_2 = (?)_{10}$

(*b*) How will you connect the output of CMOS logic circuit as an input to TTL logic circuit ? Explain your reason with suitable diagram. [6]

P.T.O.

Or

2. (*a*) Minimize the following function using Quine McClusky and implement using basic logic gates. [6]

$$f(A, B, C, D) = \pi M(1, 2, 3, 8, 9, 10, 11, 14).\ d(7, 15).$$

(*b*) Design full adder using Decoder IC 74138. [6]

3. (*a*) Explain the difference between asynchronous and synchronous counter and convert SR flip-flop into T flip-flop. Show the design. [6]

(*b*) Design and draw logic diagram of Mod 72 counter using IC 7490. [6]

Or

4. (*a*) Draw and explain Johnson counter with initial state 1110 from initial state. Explain all possible states. [6]

(*b*) Design sequence generator to generate sequence ..... 1101011..... using shift register IC 74194. [6]

5. (*a*) What is ASM chart ? Explain MUX controller method using suitable example. [6]

(*b*) Implement BCD to Excess-3 code convertor using suitable PLA. [7]

Or

6. (*a*) Implement the following function using PLA : [6]

$$f1 = \Sigma m\ (0, 3, 4, 7)$$

$$f2 = \Sigma m\ (1, 2, 5, 7).$$

(*b*) Draw the basic structure of CPLD. Explain its feature in brief. [7]

7. (*a*) What is VHDL ? Explain entity architecture for 2-bit AND and NOR gate. [6]

(*b*) Explain the difference between VHDL modeling styles-data flow, behavioral and structural. [7]

Or

8. (*a*) Write a VHDL code for 4-bit full adder using structual modeling style. [6]

(*b*) Explain the following statements used in VHDL with suitable example : [7]

(*i*) Signal assignment

(*ii*) Process.

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

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[5057]-2063

S.E. (Information Technology) (I Sem.) EXAMINATION, 2016

FUNDAMENTALS OF DATA STRUCTURES

(2015 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer *four* questions.

(*ii*) Neat diagrams must be drawn wherever necessary.

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

(*iv*) Use of calculator is allowed.

(*v*) Assume suitable data, if necessary.

1. (*a*) Explain entry controlled loop structures in C. [4]

(*b*) What are advantages of using structure ? Give difference between Union and Structure. [4]

(*c*) What is pointer variable ? Explain declaration, initialization and accessing a pointer variable with an example. [4]

Or

2. (*a*) Write pseudo C algorithm for reverse of String using pointers. [4]

(*b*) Explain concept of arrays with suitable example. [4]

(*c*) Explain call by value and call by reference functions with suitable example. [4]

P.T.O.

3. (*a*) Define the following terms with example : [6]

(*i*) Data Object

(*ii*) Data Structure

(*iii*) Abstract Data Type.

(*b*) Write Pseudo C algorithms for :

(*i*) Linear Search [3]

(*ii*) Binary Search. [4]

Or

4. (*a*) Explain Big-oh, omega and theta notation with example. [6]

(*b*) Explain selection sort with given example by showing all passes. Also analyze time complexity. Number are :

17, 35, 24, 13, 26, 14. [7]

5. (*a*) Write a pseudo C algorithm for addition of two sparse matrices. Analyze its time complexity. [6]

(*b*) Explain the two-dimensional array in detail with column and row major representation and address calculation in both the cases. [6]

Or

6. (*a*) Explain stack and write pseudo C algorithm for PUSH and POP operations of stack. [6]

(*b*) Explain polynomial representation of an array and also write data structure declaration with suitable example. [6]

7. (*a*) Explain concept of Generalized Linked List and representation polynomial using GLL with given example :

$$4x^3 + 2x^2 + 6xy + 7xy^3.$$ [6]

(*b*) Write C function to insert a node and delete a node in DLL. [7]

Or

8. (*a*) Explain with suitable example : [6]

(*i*) Circular Linked List

(*ii*) Linked List as an ADT.

(*b*) Write a pseudo C algorithm to merge two Sorted Linked Lists into the third. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[5057]-2064

S.E. (Information Technology) (First Semester)

EXAMINATION, 2016

PROBLEM SOLVING AND OBJECT ORIENTED PROGRAMMING CONCEPTS

(2015 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer 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**.

(*ii*) Neat diagrams must be drawn wherever necessary.

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

(*iv*) Assume suitable data, if necessary.

1. (*a*) Define function. What are the various types of functions ? Explain any *one* function in detail. [6]

(*b*) Write a solution to the problem of finding the largest number out of five numbers. Develop algorithm, flowchart, interactivity chart and input-output chart. [6]

Or

2. (*a*) What is the difference between an expression and equation ? Evaluate the following for the values A = 5, B = 2,

P.T.O.

C = True, D = False.

(Include the structure of the order of processing)

(*i*) R = A + 3 > B – 1 AND C OR D

(*ii*) R = NOT C OR D OR A – 3 > = B. [6]

(*b*) Explain with flowchart concept of : [6]

(*i*) While/WhileEnd

(*ii*) Repeat Until.

3. (*a*) Differentiate between Procedural Oriented Programming and Object Oriented Programming. [4]

(*b*) What is static data member and static member function ? [4]

(*c*) Write a C++ program to overload unary operator minus (–). [4]

Or

4. (*a*) Write a program in C++ for creating array of student object (for 150 students). Create class student with data members as Roll Number, Name, Address, Mobile Number and Member functions as get data and display data. Define member function outside class. [4]

(*b*) Write a C++ program to calculate the area of circle and triangle using function overloading. [4]

(*c*) Explain the syntax of operator overloading using friend function. [4]

5. (*a*) Write a C++ program to swap two numbers using concept of function template. [6]

(Without using temporary variable)

(*b*) Explain virtual function in C++. [4]

(*c*) What is STL ? Explain various components of STL. [3]

Or

6. (*a*) Write a C++ program for a function template that returns the maximum of two values. [6]

(*b*) Write a program in C++ to demonstrate concept of hierarchical inheritance. [4]

(*c*) What is 'this' pointer ? [3]

7. (*a*) Explain the following file manipulation functions with example seekg(), seekp(), and tellp(). [6]

(*b*) Explain exception handling mechanism in C++. [4]

(*c*) How to catch multiple exceptions ? [3]

Or

8. (*a*) What are C++ stream classes for console operations ? Explain it in detail with the help of diagram. [6]

(*b*) Explain the following file mode ios::trunk, iso::app, ios::ate, ios::binary. [4]

(*c*) What is formatted I/O operation ? [3]