

18/05/2017 NW

Third Semester

CS 6301 — PROGRAMMING AND DATA STRUCTURE

(Regulations 2013)

Maximum : 100 marks

PART A — (10 × 2 = 20 marks)

- PART B — (5 × 13 = 65 marks)

- Or

- (b) Explain the different types of storage classes of C++ using suitable examples.

12. (a) Demonstrate the following string operations using C++ program -
 (i) finding the length of string (ii) finding the substring from the string
 (iii) replace a given substring in a string (iv) concatenate two strings
 (v) compare two strings (vi) insert a substring in a given string.

Or

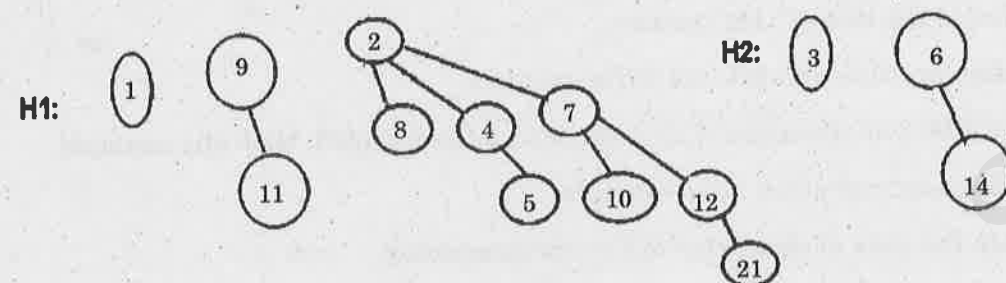
- (b) Assume the classes Person Student and PartTimeStudent are inherited from one another. Define classes with suitable data members (common and special attributes) and methods using C++ program to demonstrate the types of inheritance.

13. (a) (i) Define STL. Explain its key components and types. (5)
 (ii) Write C++ code using function template to sort the items of an array. (8)

Or

- (b) (i) Write C++ file handling routine to copy one content of file into another file. (7)
 (ii) Explain the use of exception handling in C++ with suitable example. (6)

14. (a) (i) Merge the given Binomial heaps. Write procedure for merge operation. (5+3)

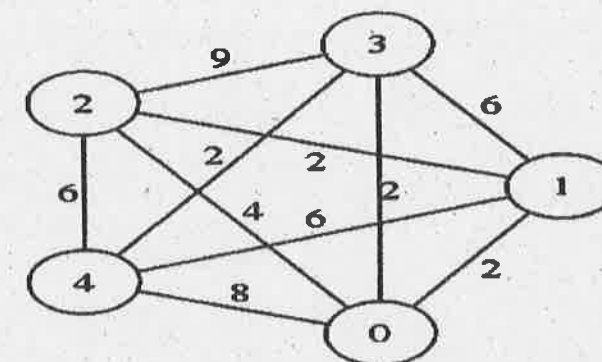


- (ii) Delete three elements from the merged Binomial Queue. (5)

Or

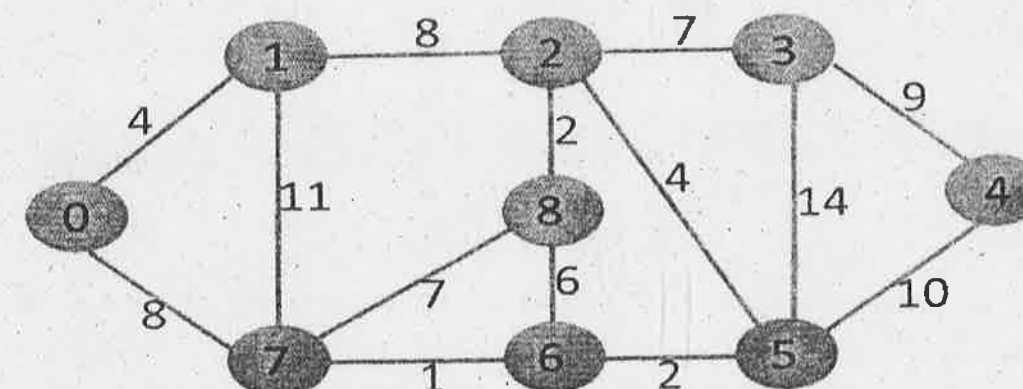
- (b) (i) Draw B-tree of order $m = 5$ for the keys {K, O, S, V, M, F, B, G, T, U, W}. (6)
 (ii) Delete the keys K and G in order. (4)
 (iii) Justify the number of splits needed for insert/delete with proper reasons. (3)

15. (a) Consider the following graph. Determine the shortest distance to all other nodes using Dijkstra's algorithm. Write Procedure. (10+3)



Or

- (b) Determine the minimum spanning tree of a given Graph using Kruskal's algorithm. Write Kruskal's MST algorithm. (10+3)



PART C — (1 × 15 = 15 marks)

16. (a) Assume the following keys form the Binary Search tree {50, 30, 60, 40, 35, 80, 90}. Analyze the time complexity involved in searching the keys 90 and then 80, when the given BST is converted into AVL or Splay tree. Identify the suitable tree data structure for representing this data and justify your answer with valid reasons.

Or

- (b) The Manager class is derived from Employee class. Use C++ virtual function to calculate salary of Employee/Manager class. Increments for employees differ based on their category. Assume suitable common and special attributes for the classes. Implement this scenario using C++ code to calculate the monthly and annual payment of each employee category.



Reg. No. :

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Question Paper Code : 40900

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018
Third Semester
Computer Science and Engineering
CS6301 – PROGRAMMING AND DATA STRUCTURES – II
(Common to Information Technology)
(Regulations 2013)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. What are the concepts in C++ that makes it Object Oriented ?
2. Write the syntax and uses of 'this pointer'.
3. Can we make a class constructor *virtual* in C++ to create polymorphic objects ?
4. How to allocate and deallocate dynamic memory ?
5. What are the main advantages of exception handling over traditional error handling ?
6. Write a sample for arithmetic binary functions.
7. Give examples for linear and non linear data structures.
8. State the Heap Order Property.
9. What are the representation of graphs ?
10. What are the applications of graph algorithms ?

PART – B

(5×13=65 Marks)

11. a) Write code in C++ to show that static members are shared among all objects. And explain. (13)

(OR)

- b) i) Consider pointer notation for the two-dimensional numeric arrays and with the following declaration fill up the table below for all values in 2D array. (7+6)

```
int nums [2] [3] = { {16, 18, 20}, {25, 26, 27} };
```

Pointer notation	Array notation	Value
....

- ii) Write the output of the following program.

```
int main ()
```

```
{
```

```
    char arr [5] [7] [6];
```

```
    char (*p) [5] [7] [6] = &arr;
```

```
    printf ("%d\n", (&arr + 1) - &arr);
```

```
    printf ("%d\n", (char*) (&arr + 1) - (char*) &arr);
```

```
    printf ("%d\n", (unsigned) (arr + 1) - (unsigned) arr);
```

```
    printf ("%d\n", (unsigned) (p + 1) - (unsigned)p);
```

```
    return 0;
```

```
}
```

12. a) Write minimum of 30 overloaded operators and all the non-overloaded operators in C++ and write C++ code to overload post and pre increment operators. (5+8)

(OR)

- b) Explain Dynamic Memory Allocation in C++ with examples for arrays and objects. (13)

13. a) List standard exceptions in C++ and show how to define user defined exception with suitable example. (6+7)

(OR)

- b) List the functions used with STL Lists. And use these functions to demonstrate STL list. (6+7)

14. a) Explain amortized analysis and its types in detail. (13)

(OR)

- b) Write pseudocode to perform rotation operation in splay tree. (13)

15. a) Write Kruskal's and Prim's (starts at F) Minimum Spanning Tree Algorithm and apply both techniques on the graph given below in Fig. 1. Can Prim's and Kruskal's algorithm yield different minimum spanning trees? Explain why or why not. (13)

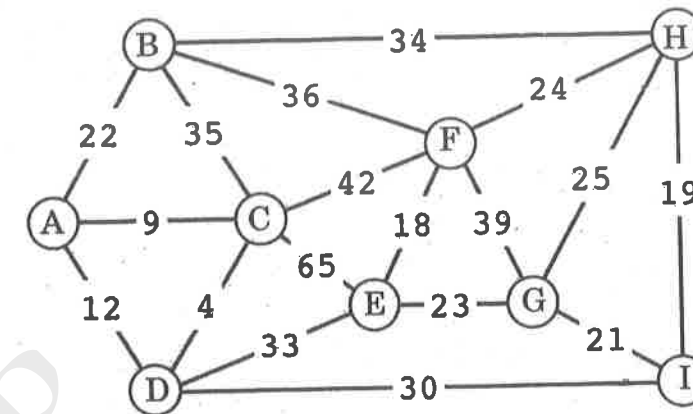


Fig. 1

(OR)

- b) Write algorithm to find shortest path using Dijkstra's method and apply the same to estimate shortest path from the graph given in Fig. 2. (13)

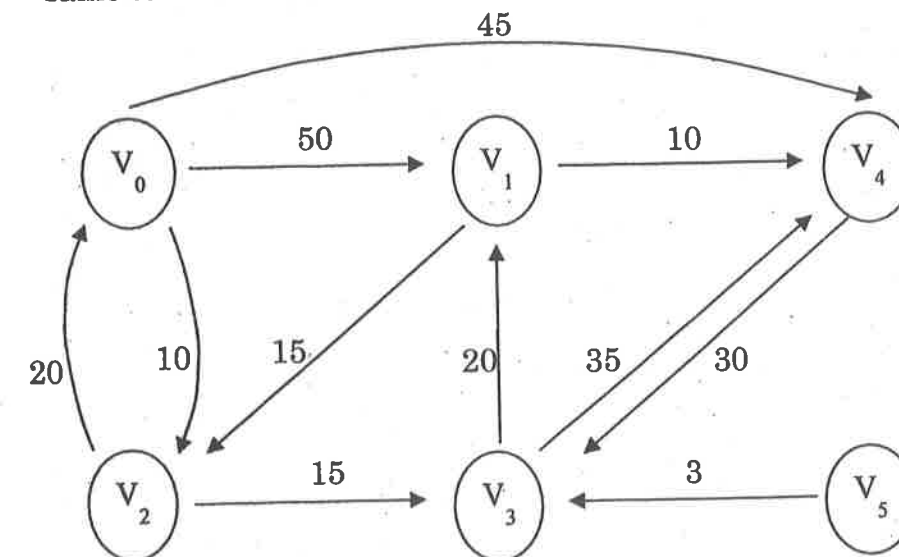


Fig. 2

PART - C

(1×15=15 Marks)

16. a) Write generic code in C++ to implement AVL tree insertion. And show the result of inserting 2, 1, 4, 5, 9, 3, 6, 7 into an initially empty AVL tree. (10+5)

(OR)

- b) Write a C++ code using function with multiple parameters to perform recursive binary search on a linear array. (15)

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B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Third Semester

Computer Science and Engineering

CS 6301 – PROGRAMMING AND DATA STRUCTURES – II

(Common to: Information and Technology)

(Regulation 2013)

(Also common to PTCS 6301 – Programming and Data Structures II for B.E.
Part-time - Second Semester – Computer science and Engineering –Regulation 2014)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define an object. Give an example.
2. What is '*this*' pointer in C++?
3. State the use of operators '*new*' and '*delete*' in C++.
4. Define inheritance. Give its types.
5. What is an abstract class? Give an example.
6. What is an exception Handling. Give an example.
7. What is a nonlinear data structure? Give an example.
8. What are disjoint sets? Give an example.
9. Define Euler path and Euler circuit of a graph.
10. What is a minimal spanning tree? Give an example.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Outline abstraction and encapsulation with an example. (6)
(ii) Explain the storage classes in C++. (7)

Or

- (b) (i) Write a C++ program to print the first 'n' prime numbers. (6)
(ii) Write a C++ program to accept a square matrix, find the transpose and print the result. Use classes and member functions. (7)

12. (a) Write a C++ program to sort an array of 'N' names in alphabetic order. (13)

Or

- (b) (i) Explain dynamic memory allocation in C++ with code snippets. (7)
(ii) What is polymorphism? Outline compile time polymorphism and runtime polymorphism with an example. (6)

13. (a) Explain exception handling in C++ with an example. (13)

Or

- (b) What is a template? Explain class template and function template with C++ code. (13)
14. (a) What is an AVL tree? Illustrate the steps in the algorithm for inserting a node into an AVL tree with an example. (13)

Or

- (b) What is a splay tree? Illustrate the steps in the algorithm for deleting a node from a splay tree with an example. (13)
15. (a) Explain the algorithm for breadth-first search traversal of a graph with an example. (13)

Or

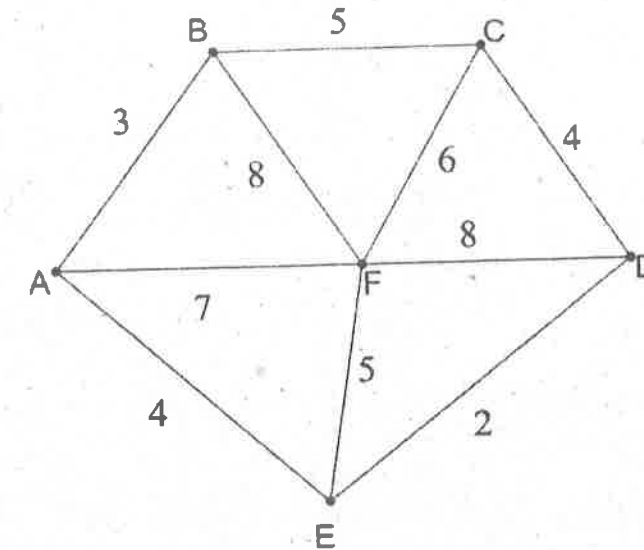
- (b) Outline the steps in the Dijkstra's single-source shortest path algorithm with an example. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Construct a B - tree of order 5 for the following key values: 1, 12, 8, 2, 25, 6, 14, 28, 17, 7, 52, 16, 48, 68, 3, 26, 29, 53, 55 and 45. Illustrate the tree construction process step by step. (15)

Or

- (b) Apply the Kruskal's algorithm to find the minimal spanning tree for the following graph: (15)



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Question Paper Code : 80287

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Third Semester

Computer Science and Engineering

CS 6301 — PROGRAMMING AND DATA STRUCTURES – II

(Common to Information Technology)

(Regulations 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List the various storage classes available in C++.
2. Mention the role of this pointer.
3. Give the list of operators that cannot be overloaded.
4. Differentiate compile and run time polymorphism.
5. What is an abstract class?
6. What is a function adaptor?
7. State the uses of virtual functions.
8. Write a note on amortized analysis.
9. Define minimum spanning tree for a graph.
10. List the drawbacks of Floyd-Warshall algorithm.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Explain features of object oriented programming in detail. (7)
(ii) Discuss the types of constructors with examples. (6)

Or

- (b) (i) What do you mean by static member function? Explain in detail with an example. (7)
(ii) Give a detailed note on const member function. (6)

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12. (a) Describe in detail dynamic memory allocation in C++ with examples. (13)

Or

- (b) Explain the types of inheritance in detail. (13)

13. (a) (i) Write short notes on C++ exception handling. (7)

- (ii) Write a C++ program to write a set of characters to a file. (6)

Or

- (b) Explain in detail about different STL containers. (13)

14. (a) Explain the possible AVL rotations with algorithm and example. (13)

Or

- (b) Explain insertion and deletion operations on Fibonacci heaps. Construct Fibonacci heaps for the following set of elements 10, 11, 5, 35, 8, 4, 2, 3, 77, 1, 45. (13)

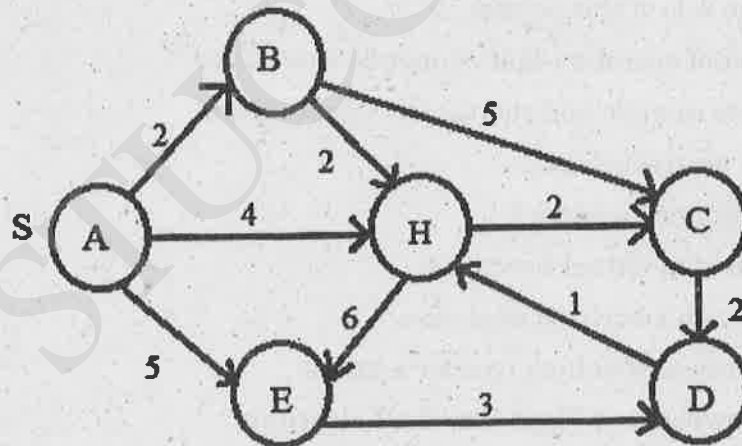
15. (a) Present the pseudocodes of the different graph traversal methods and demonstrate with an example. (13)

Or

- (b) Explain how transitive closure of a graph can be found using Warshalls algorithm. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Using Dijkstra's algorithm find the shortest path from the source node A. (15)



Or

- (b) Write a C++ generic function with multiple parameters that performs recursive binary search on a linear array. (15)

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Question Paper Code : 50382

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017

Third Semester

Computer Science and Engineering

CS 6301 – PROGRAMMING AND DATA STRUCTURES – II

(Common to : Information Technology)

(Regulations 2013)

Time : Three Hours

Maximum : 100 Marks

Codes/Tables/Charts to be permitted, if any may be indicated.

Answer ALL questions

PART – A

(10×2=20 Marks)

1. Define Encapsulation. How is it implemented in C++ language.
2. Write *call by reference* in C++ with suitable example.
3. Write C++ code snippet to copy string s1 into another string s2.
4. Write about the nested classes with example using C++.
5. List differences between *abstract class* and *abstract method*.
6. Define STL of C++ programming.
7. List differences between AVL tree and Splay tree.
8. Draw Binomial Heap representation for number of nodes $n = 7$ and give a brief note on it.
9. Define Graph data structure.
10. State the use of Floyd Warshall Algorithm.

PART – B

(5×13=65 Marks)

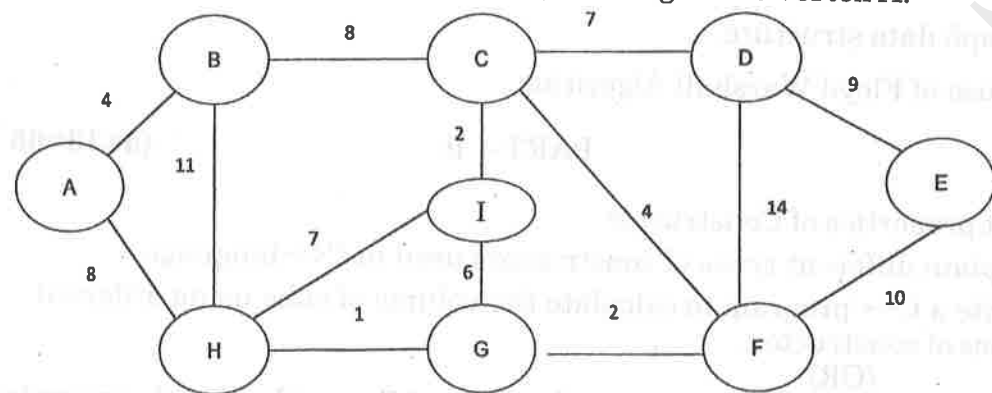
11. a) i) List properties of Constructor. (2)
 ii) Explain different types of constructors used in C++ language. (3)
 iii) Write a C++ program to calculate the volume of cube using different types of constructor. (8)
 (OR)
 b) i) Explain **static** data and **static** function of C++ with suitable examples. (4+4)
 ii) Demonstrate the use of **this** pointer with suitable example. (5)

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12. a) i) Demonstrate the use of function overloading in C++. (3)
 ii) List rules for operator overloading in C++. (3)
 iii) Write C++ program to overload + operator. (7)
 (OR)
- b) Write a C++ program to create a class **Employee** and include two derived classes called **Manager** and **Clerk**. Add appropriate data members and member functions and explain the concept of inheritance using this example. Assume Clerk and Manager have different pay schemes. Write suitable member functions to calculate pay of each employee of type Clerk and Manager. (3+3+3+4)
13. a) i) Write the uses of Exception handling. (2)
 ii) Explain different keywords used in Exception handling. (3)
 iii) Demonstrate the use of exception handling in C++ language. (8)
 (OR)
- b) i) Write C++ file handling routine to copy one content of file into another file. (6)
 ii) Demonstrate the use of Runtime polymorphism in C++ language. (7)
14. a) i) Define Balance Factor of AVL Tree. (2)
 ii) Insert the following keys into empty AVL tree one by one 44, 30, 76, 16, 39, 37. (8)
 iii) Write procedure for single and/or double rotations. (3)
 (OR)
- b) i) Write the properties of B-tree. (2)
 ii) Construct B-tree of order $m = 5$ for the following keys. 1 12 8 2 25 5 14 28 17 7 52 16 48 68 3 26 29 53 55 45 (8)
 iii) Delete the keys 8 and 55. State the rules for deletion. (3)
15. a) i) Write procedure of Dijkstra's Algorithm. (4)
 ii) Consider the given graph. Determine the shortest distance to all other nodes using Dijkstra's algorithm, starting at the vertex A. (9)



Dijkstra's Algorithm

(OR)

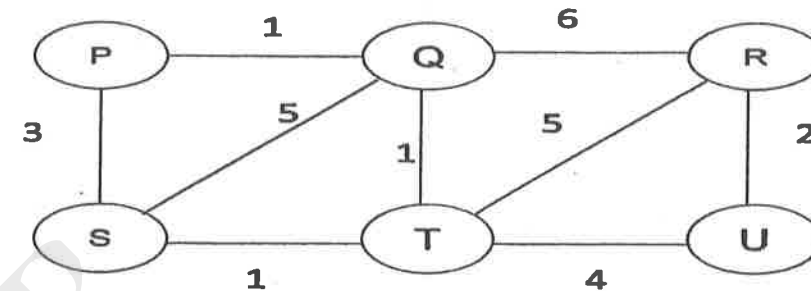
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- b) i) Define Minimum Spanning Tree (MST). (2)
 ii) For the given graph, use Kruskal's algorithm to determine the MST. (8)
 iii) Evaluate the cost of MST. Write procedure(s). (3)



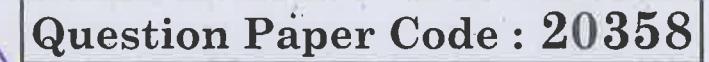
Prim's Algorithm

PART - C

(1×15=15 Marks)

16. a) Write C++ programs.
 i) Use function template to determine maximum of two values. (7)
 ii) Use class template to implement generic methods of stack (push and pop). (8)
- OR
- b) Identify the suitable tree data structure for representing data {50, 30, 60, 40, 35, 80, 90} so that the time complexity involved in searching the key should be minimum. Try three different nonlinear data structures and give diagrammatic representation of data. The data size may grow in future and may take any value. Justify your answer with valid reasons. (5+5+5)

Reg. No. :



B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018

Third Semester

Computer Science and Engineering

CS 6301 — PROGRAMMING AND DATA STRUCTURES – II

(Common to Information Technology)

(Regulations 2013)

(Also common to PTCS 6301 – Programming and Data Structures II for B.E.
(Part-Time) Second Semester – Computer Science and Engineering –
Regulations 2014)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define a class.
2. Outline the role of 'this' pointer.
3. What is a copy constructor?
4. Name the operators that cannot be overloaded in C++.
5. Define an abstract class.
6. What is an exception? Give an example.
7. What is an AVL tree?
8. Outline the properties of a red-black tree?
9. What is an undirected graph? Give an example.
10. How a directed graph can be represented as an adjacency matrix? Give an example.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Explain data abstraction and data encapsulation with examples. (7)
- (ii) Write a C++ program to perform computation of $\sin(x)$ as given below. (6)

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \frac{x^9}{9!} \dots \dots \dots N \text{ terms.}$$

Or

- (b) Write a C++ program to accept two square matrices, add the same and print the result. Use classes and member functions. (13)
12. (a) (i) What is polymorphism? Discuss compile time and run time polymorphism with examples. (7)
- (ii) Illustrate dynamic memory allocation in C++ by giving suitable examples. (6)

Or

- (b) Describe inheritance in C++. Discuss various types of inheritance in C++ by writing suitable programs. (13)
13. (a) What is a template? Outline the need for templates in C++. Give examples for different types of templates in C++. (13)

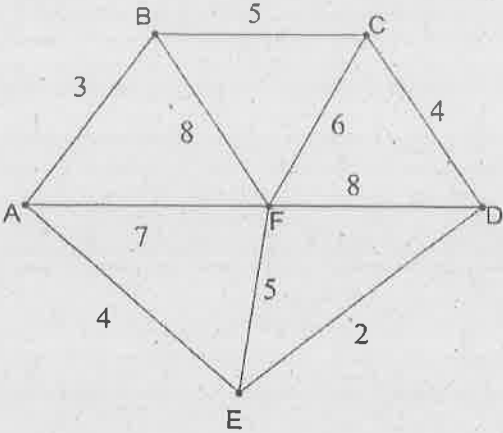
Or

- (b) Write a C++ program to copy the contents of one file to another. (13)
14. (a) Construct a B – tree of order 5 for the following key values: 1, 12, 8, 2, 25, 6, 14, 28, 17, 7, 52, 16, 48, 68, 3, 26, 29, 53, 55 and 45. Illustrate the tree construction process step by step. (13)

Or

- (b) (i) Write algorithms for arbitrary and smart unions for disjoint set ADT. (5)
- (ii) Discuss the three methods of amortized analysis with an example. (8)

15. (a) What is a minimum spanning tree? A cable company wants to connect five villages to their network as illustrated in the diagram below:



Using Prim's algorithm find the minimum length of cable needed. (13)

Or

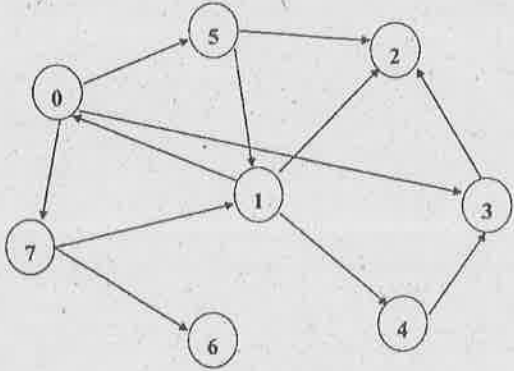
- (b) State the single-source shortest path problem and illustrate Dijkstra's algorithm with an example. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Construct a max heap and min heap by inserting the following elements: 10, 14, 9, 8, 7, 3, 12, 15, 17. Show the heap structure and array representation in each step. (15)

Or

- (b) Outline the breadth first traversal algorithm for a graph and apply the breadth first traversal algorithm to the following directed graph:



Start with node 5 and illustrate the traversal process step by step. (15)



Reg. No. :

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Question Paper Code : 91392

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Third Semester

Computer Science and Engineering

CS 6301 – PROGRAMMING AND DATA STRUCTURES – II

(Common to Information Technology)

(Regulations 2013)

(Also common to PTCS 6301 – Programming and Data Structures – II for B.E.

(Part-Time) – Second Semester – Computer Science and Engineering

– Regulations – 2014)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions

PART – A

(10×2=20 Marks)

1. Write the differences between C and C++ programming language.
2. Compare C++ reference variables with C++ pointers.
3. Outline the role of copy constructors in C++.
4. Explain the dynamic memory allocation operators of C++.
5. Identify the standard header files used for I/O operations in C++.
6. Write in brief about the keywords used in C++ exception handling.
7. Illustrate the purpose of amortized analysis.
8. Define Disjoint-set data structure.
9. Define indegree and outdegree of a directed graph.
10. Write short notes on Kruskal's Algorithm.

PART – B

(5×13 = 65 Marks)

11. a) i) Explain the different types of storage classes of C++ using a simple program. (4+4)
ii) State the use of 'this' pointer and demonstrate it using a simple C++ program. (2+3)

(OR)



- b) i) Define Constructor in C++ class. Explain how it differs from normal member functions. Differentiate default and parameterized constructors using a simple C++ program. (2+2+3+3)

- ii) Define Destructor of C++ class. List the various cases, when does destructor being called in a C++ program (3)

12. a) i) Describe function overloading and demonstrate it using a suitable C++ program (4+6)

- ii) Differentiate compile and runtime polymorphism. (3)
(OR)

- b) i) Explain operator overloading and demonstrate it using a suitable C++ program. (4+6)

- ii) Discuss the use of "nested classes" using C++ program. (3)

13. a) i) Define templates used in C++ language. Explain the syntax and the role of function and class templates using a C++ program. (2+4+4)

- ii) Discuss the use of "abstract class" using C++ program. (3)
(OR)

- b) i) Demonstrate exception handling with multiple catch blocks using C++ program. (6)

- ii) Write file handling routines to copy one file content into another file. (7)

14. a) i) Insert the following keys 10, 20, 15, 45, 60 and 5 into an empty AVL tree one by one. (7)

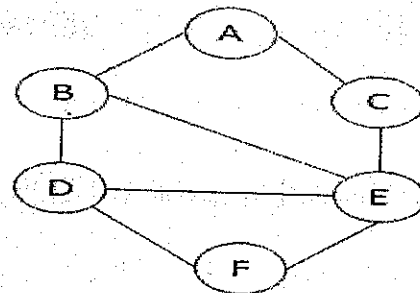
- ii) Insert the keys 1, 10, 2, 9 and 3 into empty Splay tree. (6)

(OR)

- b) i) Write the properties of B-tree. (3)

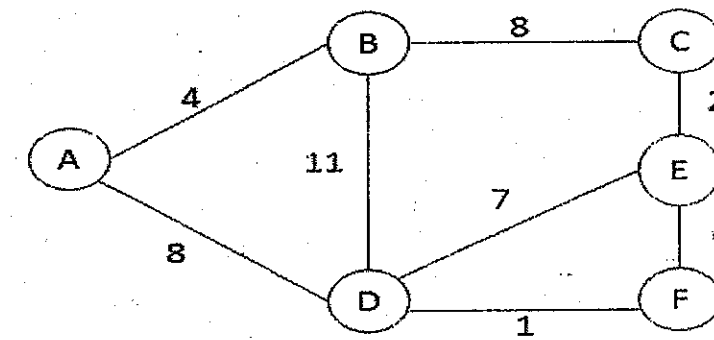
- ii) Insert the keys 1 – 10 into B-tree of order 3. Delete the key 10. (10)

15. a) Perform depth first search and breadth first search for the given graph. Write procedures. Illustrate each traversal using stack or queue. (5+5+3)



(OR)

- b) Apply Prim's Algorithm to find the minimum spanning tree. Write procedure. (10+3)



PART - C

(1×15 = 15 Marks)

16. a) Write a C++ program to implement the following. Let Employee be a parent class and Manager and Clerk derived from this class. Use virtual function calculatePay() appropriately such that the C++ program calculates payment for manager and clerk separately. Make necessary assumptions for calculation of salary/pay. (15)

(OR)

- b) Apply Dijkstra's shortest path algorithm for the given graph from the vertex 0. Write procedure. (10+5)

