RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

SECOND YEAR [2017-20]

B.A./B.Sc. THIRD SEMESTER (July – December) 2018

Mid-Semester Examination, September 2018

Date : 24/09/2018 **COMPUTER SCIENCE (Honours)**

Time : 11 am – 1pm Paper: III Full Marks : 50

[Use a separate Answer Book for each group]

GROUP – A

Answer **any four** questions **:** (4 × 5)

1. a) Prove or disprove for three non-empty sets *A, B, C* $A\bigcap(B\Delta C)=(A\bigcap B)\Delta(A\bigcap C)$. 3

   b) A relation *R* is defined in the set of natural number *N* by *a R b* where $a+3b=12$.
   Examine whether *R* is equivalence relation or not by checking all different types. 2

2. a) The function $f:\mathrm{R}\to\mathrm{R}$ be defined by

$$f(x)=\begin{cases}3x-12 & for\ x>3\\ 2x^2+3 & for\ -2<x\le 3\\ 3x^2-7 & for\ x\le -2\end{cases}$$

   Find the value of $f^{-1}(5)$. 2

   b) Draw Hasse-diagram for the partial ordering relation on the set of all subsets of $\{1,2,3,4\}$ having at most two numbers partially devoted by $\supseteq$. Also find maximal, minimal, greatest and least elements. 3

3. There are four coplanar lines. Five distinct points are there on each of these lines. Find the maximum number of triangles with vertices at these points. 5

4. a) How many solutions are there of $x_1+x_2+x_3=10$, subject to the constraints $x_1\ge 1, x_2\ge 2$ and $x_3\ge 1$. 2½

   b) How many integers must you pick in order to be sure that at least two of them have the same remainder when divided by 7? 2½

5. a) Using Warshall's algorithm, find the transitive closure of the relation *R* on $\{1,2,3,4\}$ where $R=\{(1,2),(2,1),(2,3),(3,4)\}$. 4

   b) Define Poset. 1

6. a) Show that the set of all positive rational numbers forms an abelian group under the composition defined by $a*b=(ab)/2$. 2½

   b) Prove that in a group $(G,*)$, the equation $a*x=b$ has a unique solution $x=a^{-1}*b$ where $a,b\in G$. 2½

GROUP – B

Unit -I

Answer **any two** questions**:** (2 × 5)

7. a) "Every tree has a center consisting of either one point or two adjacent points" – justify. 3
   b) Prove or disprove: "The union of any two distinct walks joining two points contains a cycle." 2
8. a) Define centroid of a tree. 1
   b) Establish the relationship in between number of vertices and pendent vertices in a binary tree. 3
   c) Define fusion. 1
9. a) Describe Prim's algorithm. 4
   b) What is arbitrarily traceable graph? 1
10. a) Describe DFS. 3
    b) "Euler graph is always connected" – justify. 2

Unit -II

Answer **any one** question**:** (1 × 5)

11. a) Write down the properties of static data members. 2
    b) Write down the properties of friend function. 2
    c) "A friend function can be called by reference" – justify. 1
12. a) How do you declare const member function? 1
    b) Explain "$\text{int } A::*ip = \&A::m;$". 2
    c) State the task of dereferencing operator. 2
13. a) What do you mean by local class? 2
    b) "Constructor can't be virtual" – justify. 2
    c) What do you mean by "$A::A()$"? 1

GROUP – C

Answer **any three** questions**:** (3 × 5)

14. What is the advantage of Threaded Binary Tree over BST? What is the difference between thread and link in the context of Threaded Binary Tree. 2½+2½
15. Design AVL tree with the following key values

    5, 1, 7, 9, 13, 2, 10, 18, 12, 20

    What is the disadvantage of AVL tree? 4+1
16. What do you mean by heapify?
    What is the time complexity of Build heap? Is heapsort is better than merge sort? – Justify your answer. 2+1+2
17. Write down the insertion function is BST. "BST is better than Binary Search in the context of searching procedure"- is this statement correct or wrong? Justify your answer. 3+2
18. Write down the deletion function in Thread Binary Tree. What is left-in-threaded tree? 3+2

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