

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

SECOND YEAR [2016-19]

B.A./B.Sc. THIRD SEMESTER (July – December) 2017

Mid-Semester Examination, September 2017

Date : 12/09/2017

Time : 11 am – 1 pm

COMPUTER SCIENCE (Honours)

Paper : III

Full Marks : 50

[Use a separate Answer Book for each group]

Group – A

(Answer any three questions)

[3×5]

1. An elementary school is offering three language classes : Spanish, French and one in German. These classes are open to any of the 100 students in the school. There are 26 students in the Spanish class, 28 in the French class and 16 in the German class. There are 12 students that are in both Spanish and French, 4 that are in both Spanish and German and 6 that are in both French and German. In addition there are 2 students taking all 3 classes.
 - a) If a student is chosen randomly, what is the probability that he or she is not in any of these classes. [2]
 - b) If a student is chosen randomly, what is the probability that he or she is taking exactly one language class? [2]
 - c) If three students are chosen randomly, what is the probability that at least one is taking language class? [1]
2. Solve the following recurrence relation using generating function technique : $a_{n+2} - 5a_{n+1} + 6a_n = 2$ with initial condition $a_0 = 1$ and $a_1 = 2$. [5]
3. Find a recurrence relation and give initial conditions for the number of bit strings of length n that do not contain the pattern 11. [5]
4.
 - a) Let $(G, *)$ be a group and $a, b \in G$ and given $a * b = b * a^{-1}$ and $b * a = a * b^{-1}$. Show that $a^4 = b^4 = e$. [3]
 - b) Prove that (G, x) is an abelian group in the following case where x denotes multiplication of numbers : $G = \{-1, 1\}$. [2]
5. Show how many reflexive and symmetric relations are there on a set with n elements. [5]

Group – B

(Answer any two questions)

[2×5]

6. Define the following terms with example—
 - a) Ring sum of two graphs. [2.5]
 - b) Product of two graphs. [2.5]
7. Find the maximum number of edges of simple graph with n vertices and K components. [5]
8.
 - a) Prove that a non-empty connected graph G is Eulerian if and only if its vertices are of even degree. [3]
 - b) Give an example of a graph which is Hamiltonian but not Eulerian. [2]

Group – C

(Answer **any two** questions)

[2×5]

9. What are the different storage classes available in C++? Explain with suitable example. [5]
10. Explain parameterized and copy constructor with suitable example. [2·5+2·5]
11. a) Explain destructor with suitable example. [2]
b) Explain friend function with suitable example. [2]
c) Define object. [1]

Group – D

(Answer **any three** questions)

[3×5]

12. a) Write down differences between Strictly Binary Tree and Complete Binary Tree. [2·5]
b) Show that the height of a complete binary tree having n nodes is $O(\log n)$. [2·5]
13. a) For any non-empty binary tree, if n_0 be the number of leaf nodes and n_2 be the number of nodes having two children, then prove that $n_0 = n_2 + 1$. [3]
b) Draw the corresponding tree whose
Pre order : 21, 22, 23, 24, 25, 26, 27, 28, 29
In-order : 22, 23, 21, 25, 24, 27, 28, 26, 29
14. a) What do you mean by height balanced tree? [2]
b) Construct AVL tree using nodes 5, 1, 8, 57, 39, 33, 90, 71, 5, 97, 66. [3]
15. a) What do you mean by Min-heap? [2]
b) Write down deletion function for deleting any node from binary Search Tree. [3]

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