RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

SECOND YEAR [2018-21]

B.A./B.Sc. THIRD SEMESTER (July – December) 2019

Mid-Semester Examination, September 2019

COMPUTER SCIENCE (Honours)

Date : 16/09/2019

Time : 1 pm – 3 pm **Paper : III** Full Marks : 50

Group - A

Answer **any three** questions of the following: (3 × 5 = 15)

1. a) A fire insurance company has high-risk, medium-risk and low-risk clients who have respectively probabilities 0.02, 0.01 and 0.0025 of filing claim within a given year. The proportions of number of clients in the three categories are 0.10, 0.20 and 0.70 respectively. What proportion of the claims filed each year come from high-risk clients? (3)

   b) A Kingdoms king's father had two children. What is the probability that the king's sibling is a girl? Explain your assumptions and possibility of other answers. (2)

2. a) Urn A has four red, three blue and two green balls. Urn B has two red, three blue and four green balls. A ball is drawn from urn A and put into urn B, and then a ball is drawn from urn B. What is the probability that a red ball is drawn from urn B? If a red ball is drawn from urn B, what is the probability that a red ball was drawn from urn A? (3)

   b) A fair coin is tossed five times. What is the probability of getting a sequence of three heads? If the coin was tossed 100 times, what is the probability of getting head at 101th time? Show working. (2)

3. a) In a game of poker, what is the probability that a five hand will contain

   i) A straight (Five cards of unbroken sequence)

   ii) Four of a kind.

   iii) A full house (Three cards of one kind and two of another kind)

   Explain your solution. (5)

4. Find recurrence relation for the number of ways a person can climb n steps when

   i) The person can skip at most one step at a time

   ii) At most two steps at a time. Give initial condition for each step. (5)

5. a) For three non-empty sets A, B and C prove that

   $A \cap (B - C) = (A \cap B) - (A \cap C)$ (2.5)

   b) Among the positive integers less than or equal to 100, how many even integers are not divisible by 5? (2.5)

Group – B

Answer **any two** questions of the following: (2 × 5 = 10)

6. Define any two of the following terms with suitable example:

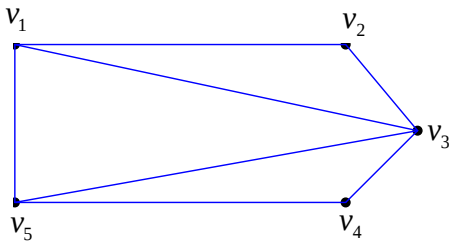
   i) Strongly connected graph.

   ii) Balanced graph.

   iii) Fusion. (2.5+2.5)

7. a) What is circuit matrix ? (1)

b) Find the number of walks with length three form vertex v_1 to v_5 for following graph: (4)



8. a) Prove that for self complementary graph the number of vertices should be 4n or 4n+1, where n is positive number. (2.5)

b) Prove that graph containing Euler trail has exactly two odd degree vertices. (2.5)

Group – C

Answer **any two** questions of the following: (2 × 5 = 10)

9. What are the different types of polymorphism in C++ ? Explain with suitable example. (5)

10. a) What do you mean by namespace ? (2.5)

b) What is pure virtual function ? (2.5)

11. What are the different types of overloading Explain with suitable examples . (5)

12. a) What is a class template ? (2.5)

b) What do you mean by virtual destructor ? (2.5)

Group – D

Answer **any three** questions of the following: (3 × 5 = 15)

13. a) Write a C function to convert a Binary tree into its mirror tree. (2.5)

b) Using following inorder and postorder traversal construct a Binary tree: (2.5)

Inorder : D, G, A, H, E, B.

Postorder : G, D, E, H, B, A.

14. a) Write a C function to delete a node with two children from a Binary Search Tree (BST). (2.5)

b) Construct a Height Balanced Tree using following elements. (2.5)

24, 19, 18, 28, 30, 25, 27, 26.

15. a) Compare Heap sort with the Merge sort in term of following three characteristics: (2.5)

i) Time to access memory location

ii) Parallelism

iii) Space taken in singly linked list version of Merge sort and doubly linked list version of Heap sort implementation.

b) Insert the following nodes in a Red Black tree. (2.5)

35, 7, 11, 40, 60.

16. a) Suppose we have a 100,000 characters data file that we wish to store compactly. We assume that there are only 6 different characters in that file. The frequency of the characters are given by

Character:	a	b	c	d	e	f
Frequency:	45	13	12	16	9	5 (in Thousands)

(3)

How to represent such a file of information using variable length code word.

b) What is the purpose of Threaded Binary tree in Data Structure. (2)

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