Maulana Abul Kalam Azad University
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**Utech**

# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

**Paper Code : BMN-301**

**PUID : 03498 (To be mentioned in the main answer script)**

## MATHEMATICS FOR COMPUTING

Time Allotted : 3 Hours                    Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

## GROUP – A

### ( Multiple Choice Type Questions )

1. Choose the correct alternatives for any *ten* of the following :                    10 × 1 = 10

   i) Which of the following is not a proposition ?

   a) The statement is false

   b) Close the door

   c) It is raining today

   d) He is tall.

ii) The solution to the recurrence relation $a_n = a_{n-1} + 2n$, with initial term $a_0 = 2$ are

   a)    $4n + 7$           b)    $2(1 + n)$

   c)    $3n_2$              d)    $5 * (n+1)/2$.

iii) How many nodes are necessary to construct a graph with exactly 6 edges in which each node is of degree 2 ?

   a)    5               b)    6

   c)    7               d)    4.

iv) If two graphs G1 & G2 are isomorphic then

   a)    they have equal number of edges and vertices

   b)    they have equal number of vertices with same degrees

   c)    there is one to one correspondence between their vertices as well as edges

   d)    all of these.

v) What is a complete binary tree ?

   a)    Each node has exactly zero or two children

   b)    A binary tree, which is completely filled, with the possible exception of the bottom level, which is filled from right to left

   c)    A binary tree, which is completely filled, with the possible exception of the bottom level, which is filled from left to right

   d)    A tree in which all nodes have degree 2.

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vi) The height of a BST is given as $h$. Consider the height of the tree as the no. of edges in the longest path from root to the leaf. The maximum no. of nodes possible in the tree is

a) $2^{h-1} - 1$

b) $2^{h+1} - 1$

c) $2^h + 1$

d) $2^{h-1} + 1$.

vii) Which indicates pre-order traversal ?

a) Left sub-tree, Right sub-tree and root

b) Right sub-tree, Left sub-tree and root

c) Root, Left sub-tree, Right sub-tree

d) Right sub-tree, root, Left sub-tree.

viii) In a lottery, there are 10 prizes and 25 blanks. A lottery is drawn at random. What is the probability of getting a prize ?

a) 1/10

b) 2/5

c) 2/7

d) 5/7.

ix) Poisson distribution is applied for

a) Continuous Random Variable

b) Discrete Random Variable

c) Irregular Random Variable

d) Uncertain Random Variable.

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x)   'Less than type distribution' and 'more than type distribution' are types of

    a)   class distribution

    b)   cumulative class distribution

    c)   cumulative frequency distribution

    d)   upper limit distribution.

xi)  Number of times each value appears is called value's

    a)   range           b)   mode

    c)   frequency       d)   standard deviation.

xii) Data presented in form of frequency data is known as

    a)   grouped data     b)   ungrouped data

    c)   secondary data   d)   calculated data.

## GROUP – B

### ( Short Answer Type Questions )

Answer any *three* of the following.   $3 \times 5 = 15$

2.   Using truth table technique establish that the following proposition is tautology :

$\sim (p \wedge (\sim p \vee q)) \vee q$.

3. Find the mean of the following distribution :

| Age in years | 15-19 | 20-24 | 25-29 | 30-34 | 35-44 | 45-59 | Total |
|---|---|---|---|---|---|---|---|
| No. of persons | 37 | 81 | 43 | 24 | 9 | 6 | 200 |

4. Show that the complete bipartite graph $K_{2,2}$ is Hamiltonian.

5. Prove that a graph with $n$ vertices and $(n-1)$ edges is a tree.

6. Show that the probability that exactly one of the events $A$ & $B$ occurs is $P(A) + P(B) - 2P(AB)$.

## GROUP – C

### ( Long Answer Type Questions )

Answer any *three* of the following.   3 × 15 = 45

7. a) Find the mean and standard deviation of the composite set from the mean and standard deviation of its component sets as given in the following table :

| | First set | Second set | Third set |
|---|---|---|---|
| Number of observation | 200 | 250 | 300 |
| Arithmetic mean | 25 | 10 | 15 |
| Standard deviation | 3 | 4 | 5 |

b) The mean and variance of a group of 100 observations are 6·5 and 3·0 respectively. 55 of these observations have mean 6·6 and standard deviation 1·5. Find the mean and standard deviation of the remaining 45 observations.  8 + 7

8. a) Draw a simple planar graph with 6 nodes and 11 edges. Determine the number of regions.

b) Find the shortest path using Dijkstra's algorithm from the node $a$ to the node $z$ in following graph $G$.
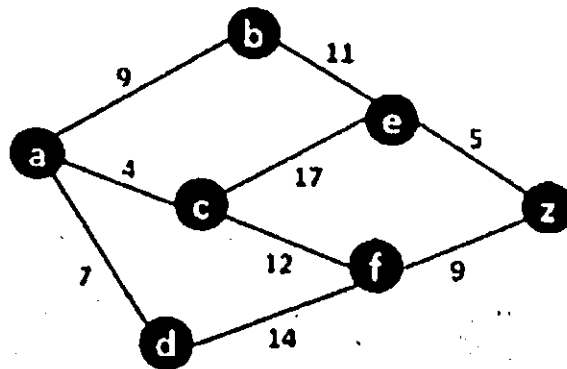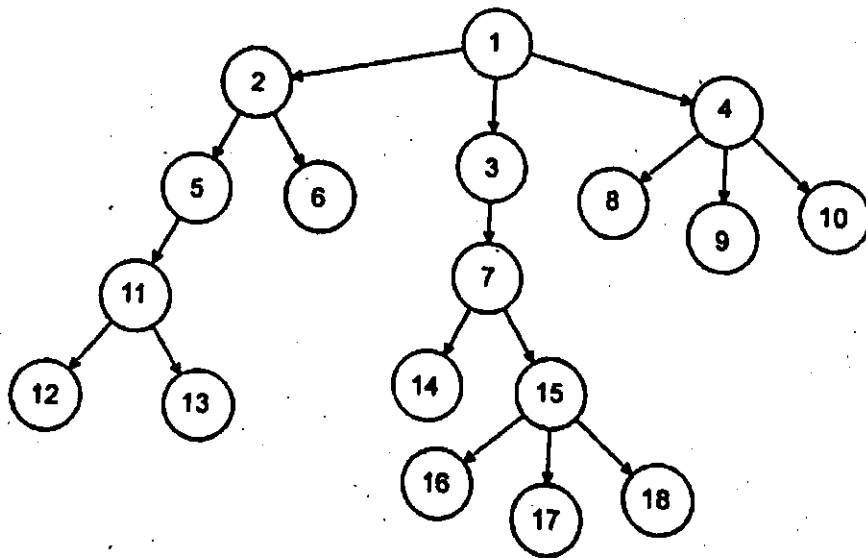


( 3 + 3 ) + 9

9. a) $X$ is a discrete random variable having following probability mass function :

| $x$ | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| $P(X = x)$ | 0 | $k$ | $2k$ | $2k$ | $3k$ | $k^2$ | $2k^2$ |

Determine (i) $k$, (ii) $P(X < 6)$, (iii) $P(X \geq 6)$.

b) For what value of $a$ will the function $f(x) = ax; x = 1,2,3,...,n$ be the probability mass function of a discrete random variable $x$ ? Find the mean & variance of $x$.  9 + 6

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10. a) Solve the recurrence relation $T(2k) = 3T(2k-1)+1$, $T(1)=1$.

  b) Solve the recurrence relation $a_n + a_{n-1} - 6a_{n-2} = 0$ for $n \geq 2$ given that $a_0 = -1$ and $a_1 = 8$.     8 + 7

11. a) i) Construct optimal tree for weights 8, 9, 10, 11, 13, 15, 22 using Huffman algorithm.

   ii) Find the weight of the tree.

  b) Convert the following N-Ary tree into Binary tree



8 + 2 + 5

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