



ST. FRANCIS DE SALES COLLEGE

A FRANSALIAN INSTITUTE OF HIGHER EDUCATION **AUTONOMOUS**

NAAC A GRADE • AFFILIATED TO BANGALORE UNIVERSITY • AICTE APPROVED • 2(F) & 12 (B) RECOGNITION OF UGC • ISO 9001:2015 CERTIFIED

Electronics City PO, Bengaluru - 560 100, Karnataka, INDIA • (+91) 8088140679 • pro@stscollege.in • www.stscollege.in

END SEMESTER EXAMINATION – DECEMBER 2024

COMPUTER SCIENCE – I SEMESTER BCA

24BCA13 - DISCRETE STRUCTURES

Time: 3 Hours

Max. Marks: 80

Instruction: Answer should be written completely in English

SECTION – A

I Answer any FIVE of the following questions.

(5X2=10)

1. Define subset. Give an example.
2. If $A = \{3,4\}$, $B = \{2,4\}$, $C = \{4,5\}$. Find $(A - B) \times (B - C)$.
3. Define Onto Function.
4. State Pigeonhole principle.
5. If ${}^n C_9 = {}^n C_8$ then find ${}^n C_{17}$.
6. Define Hamiltonian Graph.
7. Define Scalar matrix with an example.
8. Evaluate
$$\begin{vmatrix} 3 & -4 & 5 \\ 1 & 1 & -2 \\ 2 & 3 & 1 \end{vmatrix}.$$

SECTION – B

II Answer any SIX of the following questions.

(6X5=30)

9. Let R be the relation on the Set $\{1,2,3,4,5\}$ defined by the rule $(x, y) \in R$ if $x + y \leq 6$.
 - List the elements of R and R^{-1}
 - Domain of R and R^{-1}
 - Range of R and R^{-1}
10. For all $n \geq 1$, prove that $1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$.
11. If $f(x) = 2x+3$ then show that f is 1-1, onto and hence find f^{-1} .
12. Find n , if ${}^{2n} C_3 : {}^n C_3 = 12 : 1$.
13. Explain operations on Graphs with an example.
14. Solve using Cramer's rule $3x + y + z = 3$, $2x + 2y + 5z = -1$, $x - 3y - 4z = 2$.
15. Explain Tree Traversal and also explain its types Pre order, In order and Post order.



16. How many different words can be formed with the letters of the word HARYANA?
 How many of these: a) Have H and N together? b) Have three vowels together?
 c) Begin with H and end with N?

SECTION – C

III Answer any FIVE of the following questions.

(5X8=40)

17. a) In a survey of 100 persons, it was found that 30 read magazine A, 40 read magazine B and 50 read magazine C, 10 read magazine A and B, 10 read magazine A and C and 5 read magazine B and C. Find the number of persons who read all the 3 magazines? How many read only magazine C?
 b) State and prove distributive law for any three sets A, B and C.

18. Prove that, for any propositions p, q, r the compound propositions $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$ is a tautology.

19. Find the inverse of $\begin{bmatrix} 1 & 0 & -1 \\ 3 & 4 & 5 \\ 0 & -6 & -7 \end{bmatrix}$.

20. a) Solve for A and B if $3A + 2B = \begin{bmatrix} 21 & 15 & 1 \\ 21 & 2 & 12 \end{bmatrix}$ and $2A - 3B = \begin{bmatrix} -12 & -11 & 5 \\ 1 & -16 & 8 \end{bmatrix}$.
 b) Find the Eigen values of $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$.

21. a) How many words with or without meaning can be made from the letters of the word MONDAY assuming that no letter is repeated, if

- i) 4 letters are used at a time
- ii) All letters are used at a time
- iii) All letters are used but first letter is a vowel?

b) Write the inverse, converse and contrapositive of

p: Sides of a quadrilateral are equal
 q: it is a square

22. Explain Kruskal's Algorithm and find minimum weight spanning tree by Kruskal's algorithm.

