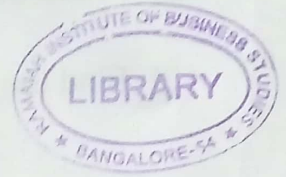SE – 255

I Semester B.C.A. (Full Stack Development) (AI & ML) (Data Science)
Examination, January/February 2026
(SEP 2024 – 25)
COMPUTER APPLICATION
24BCA11 : Discrete Structures

Time : 3 Hours

Max. Marks : 80

Instruction : *Answer all the Sections.*

SECTION – A

I. Answer **any eight** questions. **Each** question carries **two** marks.   (8×2=16)

1) Define Disjoint set.

2) If A = {3, 4, 5} B = {3, 4, 7, 9} find
   i) A – B   ii) A ∪ B

3) Construct the truth table for $q \wedge \sim q$.

4) If $A = \begin{bmatrix} 2 & 4 \\ 3 & -5 \end{bmatrix}$ find A^2.

5) Define Scalar matrix with example.

6) There are 6 people in a contest. How many ways can 1st and 2nd place be awarded ?

7) Find the rank of the matrix $\begin{bmatrix} 1 & 5 \\ 3 & 9 \end{bmatrix}$.

8) Define combination.

9) Define Acyclic graph with example.

10) Define Planar graph.

SECTION – B

II. Answer **any four** questions. **Each** question carries **six** marks.   (4×6=24)

11) In a class of 40 students, 20 have chosen Mathematics, 15 have chosen mathematics but not biology. If every student has chosen either mathematics or biology or both, find the number of students who chose both mathematics and biology and the number of students chose biology but not mathematics.

P.T.O.

12) Prove that $\sim(p \leftrightarrow q)$, $p \leftrightarrow \sim q$ & $\sim p \leftrightarrow q$ are equivalent.

13) Find the adjoint of $A = \begin{bmatrix} -5 & 7 \\ -2 & 3 \end{bmatrix}$ and hence show that $A(\text{Adj } A) = |A|I$.

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

15) Explain different forms of graphs.

16) Solve using matrix method $2x - 3y = 1$, $3x - y = 3$.

SECTION – C

III. Answer **any five** questions. **Each** question carries **eight** marks. $(5\times8=40)$

17) a) Show that $f : R \to R$ is defined by $f(x) = 4x + 5$ is both one-one and onto. 4

   b) Consider the function $f : R \to R$ and $g : R \to R$ defined by $f(x) = x^2 + 3x + 1$ and $g(x) = 2x - 3$. Find the composite functions

   i) $f \circ g$

   ii) $g \circ f$ 4

18) Using the principle of mathematical induction prove that

   $$1.2 + 2.3 + 3.4 + ... + n(n+1) = \frac{n(n+1)(n+2)}{3}$$

19) Find the eigen value and eigen vectors of $A = \begin{bmatrix} -3 & 8 \\ -2 & 7 \end{bmatrix}$.

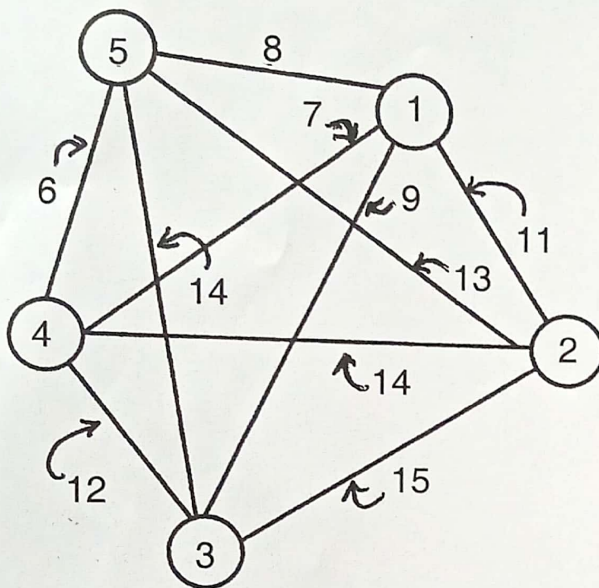20) Solve using Cramer's rule :

   $4(y - x) = 5z - 22$

   $3z + 4x = 6y + 2$

   $z - 3y = 14 - 10x$

21) What is the number of ways of choosing 4 cards from a pack of 52 playing cards ? In how many of these

    i) Four cards of same suit

    ii) Four cards belongs to different suit

    iii) Two are red cards and two are black cards

    iv) Cards are of same colour.

22) Find the minimum weight spanning tree by Prim's Algorithm.

23) a) In how many ways the letters of the word MISSISSIPPI be arranged so that four S's are not together ?   4

    b) Write converse, inverse and contrapositive of the conditional statement "If S is an equilateral triangle, then S is an Isosceles triangle".   4