I Semester B.C.A. (Full Stack Development) (AI&ML) (Data Science) Examination, January 2025
(SEP 2024-25)
COMPUTER SCIENCE
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) If A = {1, 2}, B = {3, 4, 5} find $A \times B$.
2) Find the intersection $A \cap B$ and set difference $A - B$ where A = {1, 3, 5, 7, 9} B = {2, 3, 4, 5, 6, 8}.
3) Construct the truth table for $\sim(P \wedge q)$.
4) Evaluate $\begin{vmatrix} x & x+1 \\ x-1 & x \end{vmatrix}$.
5) Define unit matrix with example.
6) Define tautology and contradiction.
7) If $A = \begin{bmatrix} 2 & 7 & 3 \\ 4 & -5 & 6 \end{bmatrix}$ show that $(A')' = A$.
8) Define permutation.
9) Define : 1) Graph 2) Regular graph.
10) Define graph Isomorphism.

SECTION – B

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

11) In a class of 35 students 24 likes to play cricket and 16 likes to play foot ball. Also each student likes to play atleast one of the two games. How many students likes to play both cricket and football ?
12) Prove that $\sim(p \to q) \leftrightarrow (p \wedge \sim q)$ is tautology or not.
13) If $A = \begin{bmatrix} 2 & 1 & 4 \\ 7 & 3 & 6 \end{bmatrix}$ $B = \begin{bmatrix} 6 & 4 & 3 \\ 3 & 2 & 5 \\ 7 & 3 & 1 \end{bmatrix}$ find AB.
14) Solve by matrix method. $x + y = 2$; $2x + 3y = 3$.

15) Define walk, path, circuit with example.

16) Find the inverse of matrix $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$.

SECTION – C

III. Answer **any five** questions. **Each** carries **eight** marks. **(5×8=40)**

17) Let A = {1, 2, 3, 4, 6}. Let R be the relation on A by {{(a, b)/a, b ∈ A} and b is exactly divisible by a}
   1) Write in Roaster method.
   2) Find the domain of relation R.
   3) Find the range of relation R.
   4) Find inverse of a relation R^{-1}.

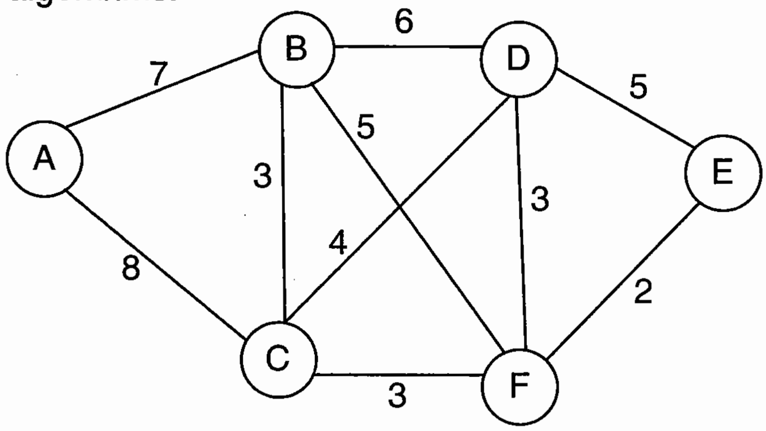
18) Using mathematical induction prove that $1 + 2 + 3 + ... + n = \frac{n(n+1)}{2}$.

19) Find the eigen value and eigen vectors of $A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$.

20) a) Solve by Cramer's rule $3x + 4y = 7$
$7x - y = 6$. **4**
   b) Explain types of matrices. **4**

21) Prove that $p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$.

22) Obtain minimum spanning tree for the following graph using Kruskal's algorithms.



23) a) In how many ways can the letters of the word "EQUATION" can be arranged in such a way that the vowels always come together.
   b) Write converse, inverse and contra positive of a statement "If x is less than 1 then x is a prime number".