QP-3257

Seat No. 21904

Total No. of Pages : 4

OCT_NOV_2024 WINTER EXAMINATION

12329 Bachelor of Computer Application(BCAsci) NEP 2.0

Sub. Name: Mathematics Foundations to Computer Science-I

Sub. Code: 109807

Day and Date: FEBRUARY ,15-02-2025 **Total Marks: 80**

Time: 10:30 AM To 01:30 PM

Instructions: **1. Use of Scientific calculator is allowed**

Special Inst.: **1) Que.1 and Que. 8 are compulsory.**
2) Attempt any FOUR questions from Que. No.2 to Que. No. 7.
3) Figures to the right indicate marks.

Q1) A. Select the correct alternative and rewrite **[10]**

i. What is the cardinality of the set {a, b, c, d, e}?

A. 5
B. 4
C. 3
D. 6

ii. Which of the following properties must an equivalence relation satisfy?

A. Reflexive, Asymmetric, Transitive
B. Reflexive, Antisymmetric, Transitive
C. Reflexive , Symmetric, Transitive
D. Reflexive and Transitive only

iii. Which of the following statements is true about an equivalence relation?

A. It never creates distinct subsets
B. It always partitions a set into disjoint subsets
C. It only contains reflexive pairs
D. It must be antisymmetric

iv. If there are 6 shirts and 4 pairs of pants, how many different outfits can be made by choosing one shirt and one pair of pants?

A. 10
B. 2
C. 24
D. 15

v. In how many ways can 3 people be arranged in a row if one specific person must always be first?

A. 6
B. 2
C. 3
D. 1

vi. The recurrence relation for the Fibonacci sequence is:

A. $F_n = F_{n-1} + F_{n-2}$
B. $F_n = F_{n-1} + 2F_{n-2}$
C. $F_n = 2F_{n-1} + F_{n-2}$
D. $F_n = F_{n-1} - F_{n-2}$

vii A graph with no self-loops and no multiple edges is called

A. a multigraph
B. a pseudo graph
C. a complete graph
D. a simple graph

vii A graph in which there is a path between every pair of vertices is called

i.

A. a complete graph
B. a connected graph
C. a disconnected graph
D. a pseudo graph

ix. For two matrices A and B to be added, they must have:

A. The same number of rows
B. The same number of columns
C. The same order (rows and columns)
D. Any random order

x. The determinant of a singular matrix is always

A. 0
B. 1
C. -1
D. ± 1

B. Solve the following questions (Any two out of three) [10]

1. Explain the difference between polynomial, exponential, and logarithmic functions with examples.
2. State and explain the Addition and Multiplication principles of counting with examples.
3. Define the terms walk, trail, and path in a graph with examples.

Q2) A. Compute the determinant of the matrix $\begin{pmatrix} 11 & 12 & -3 \\ 5 & 6 & -8 \\ 3 & 8 & 1 \end{pmatrix}$ [5]

B. Define orthogonal matrix and check whether $A = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$ is orthogonal or not? [5]

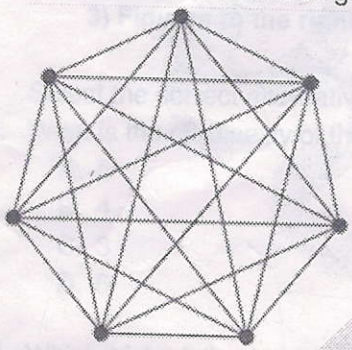
Q3) A. Let $A = \{all\ straight\ lines\ in\ a\ plane\}$ and define R such that $L_1 R_{L_2} => L_1 || L_2$. Prove that R is an equivalence relation. **[5]**

B. Define the inverse of a function $f(x)$. Find the inverse of $f(x) = 2x + 3$. Verify it. **[5]**

Q4) A. Find the number of ways to arrange the letters in the word **"MATHEMATICS"** **[5]**

B. Find the coefficient of x^5 in the expansion of $(2x + 3)^7$ using the Binomial Theorem. **[5]**

Q5) A. Define a complete graph. How many edges does a n complete graph with vertices have? Check given graph is a complete graph or not. **[5]**



B. Define an Eulerian graph. State and prove the necessary and sufficient conditions for a graph to be Eulerian. **[5]**

Q6) Calculate the inverse of a given matrix and check whether it is an Orthogonal matrix or not **[10]**

$$\begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & 0 \\ -\frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Q7) Let $A = \{1, 2, 3, 4, 5\}, B = \{2, 4, 6, 8, 10\}$ find i) $A \cup B$ ii) $A \cap B$ iii) AXB iv) BXA v) $A - B$ vi) $B - A$ vii) Is there any mapping between A and B **[10]**

Q8) Attempt any 4 questions out of 6 **[20]**

A) Define binomial coefficients and prove that $\binom{n}{r} = \binom{n}{n-r}$.

B) A password consists of 4 letters followed by 3 digits. How many different passwords of a maximum length of 7 can be formed if repetition is allowed?

C) What is the difference between a simple graph and a multigraph? Give an example.

D) Define a subgraph. Give an example and explain how a subgraph is formed.

E) Differentiate between an upper triangular matrix and a lower triangular matrix with examples.

F) Define the inverse of a matrix. What is the condition for a matrix to have an

inverse?

End Of Question Paper

Important Note for Chief Exam Officer / SRPD Coordinator / Sr Supervisor/ Student -
This Question Paper may be distributed for following Subjects as common code.
सदरची प्रश्नपत्रिका खालील विषयांकरिता वितरित करता येईल.

1] (12329) Bachelor Of Computer Application (NEP2.0)

(109807) Mathematics Foundations to Computer Science-I Part 1 SEM 1