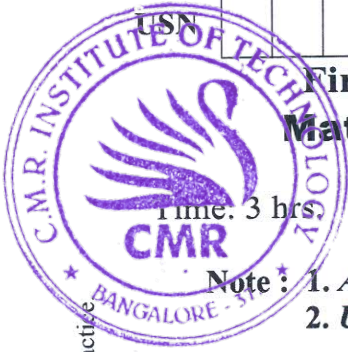


CBCS SCHEME

20MCA14



USN

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First Semester MCA Degree Examination, Jan./Feb. 2023 Mathematical Foundation for Computer Application

Max. Marks: 100

Time: 3 hrs.

- Note : 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of Statistical Tables is permitted.

Module-1

- Define Subset, Null set and Power set with an example for each. (06 Marks)
 - Find the number of positive integers less than or equal to 2076 and divisible by 3 or 4. (06 Marks)
 - Find the Eigen values and Eigen vectors of $\begin{pmatrix} 3 & 2 \\ -1 & 0 \end{pmatrix}$. (08 Marks)

OR

- State and prove Associative laws of Set theory. (06 Marks)
 - A survey of 500 viewers of a sports channel produced the following information :
285 watch baseball, 195 watch shuttle, 115 watch kabbadi, 45 watch baseball and kabbadi, 70 watch baseball and shuttle, 50 watch shuttle and kabbadi and 50 do not watch any of 3 kinds of games. i) How many viewers watch all 3 kinds of games? (06 Marks)
 - State Pigeonhole Principle. P.T if 5 colors are used to paint 26 doors, at least 6 doors will have the same color. (08 Marks)

Module-2

- Define Biconditional with an example. Let p, q, r to propositions having truth values 0, 0, 1 respectively. Find the truth value of the compound proposition $p \wedge (r \rightarrow q)$. (06 Marks)
 - Define Tautology. With an example using truth table, prove that $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$ is a tautology. (08 Marks)
 - Test the validity of the statement "If Socrates is a man, Socrates is mortal. Socrates is a man" Therefore Socrates is mortal. (06 Marks)

OR

- Prove that $\forall x, p(x) \vee q(x) \Rightarrow \forall x, p(x) \vee \exists x, q(x)$. (04 Marks)
 - Define Universal Quantifier and Existential Quantifier with an example. (06 Marks)
 - Give i) Direct proof ii) Proof by contradiction of the statement, "If n is an even integer, then $n + 7$ is an odd integer". (10 Marks)

Module-3

- Define Cartesian product of sets with an example. If A is a set with m elements and B is a set with n elements, find the number of relations from A to B. (10 Marks)
 - Define Equivalence relation.
Let $A = \{1, 2, \dots, 7\}$ and $S = \{(a, b) / a - b \text{ is divisible by } 3\}$, verify that S is an equivalence relation. (10 Marks)

OR

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg, $42+8=50$, will be treated as malpractice.

- 6 a. For any 3 non empty sets A, B, C prove that i) $A \times (B \cap C) = (A \times B) \cap (A \times C)$.
 ii) $A \times (B - C) = (A \times B) - (A \times C)$. (10 Marks)
 b. Define Partial Order relation R on A. Show that the inclusion relation \subset is a partial order in the power set of a set S. Determine whether the relation represented by the following zero one matrix is a partial order

$$M_R = \begin{pmatrix} 1 & 0 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix}$$

(10 Marks)

Module-4

- 7 a. The probability density function P(x) of a variable X is given by the following table :

| | | | | | | | |
|------|---|----|----|----|----|-----|-----|
| X | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| P(x) | K | 3K | 5K | 7K | 9K | 11K | 13K |

For what value of K, does this represent a valid probability distribution?

Find $P(x < 4)$ $P(x \geq 5)$ $P(3 < x \leq 6)$. Determine the minimum value of K so that $P(x \leq 2) \geq 0.3$. (10 Marks)

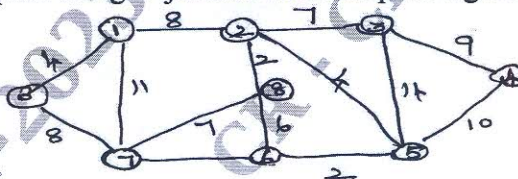
- b. The probability that a pen manufactured by a company will be defective is 0.1. If 12 such pens are selected, find the probability that i) exactly 2 will be defective
 ii) at least 2 will be defective iii) none will be defective. (10 Marks)

OR

- 8 a. In a certain town, the duration of a shower is exponentially distributed with mean equal to 5 minutes. What is the probability that a shower will last for i) less than 10 minutes ii) 10 minutes or more? (10 Marks)
 b. The weekly wages of workers in a company are normally distributed with mean of Rs 700 and standard deviation of Rs 50. Find the probability that the weekly wage of a randomly chosen worker is i) between Rs 650 and Rs 750 ii) more than Rs 750. (10 Marks)

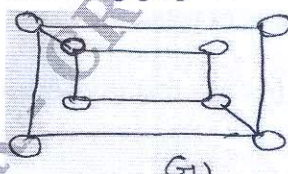
Module-5

- 9 a. Define Euler path, Hamilton path and Planar graph with an example for each. (06 Marks)
 b. Determine the shortest path using Dijkstra's shortest path algorithm. (14 Marks)

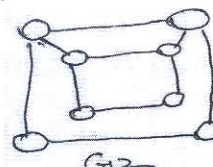


OR

- 10 a. Define Graph Coloring and Euler graph. (04 Marks)
 b. Define Isomorphism in graphs. (04 Marks)
 c. Check whether the following graphs are isomorphic?



G1



G2

Give reasons for the same.

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(12 Marks)