CBCS SCHEME

USN | | | | | | | | | | | **20MCA14**

First Semester MCA Degree Examination, July/August 2021
Mathematical Foundation for Computer Applications

Time: 3 hrs. Max. Marks: 100

Note: *1. Answer any FIVE full questions.*
2. Distribution tables are allowed.

1 a. Define: i) Symmetric difference of two sets ii) Power set, with an illustration for each. **(06 Marks)**

b. State pigeonhole principle. ABC is an equilateral triangle whose sides of length 1m. If we select 10 points inside the triangle, prove that at least two of these points are such that the distance between them is less than 1/3m. **(07 Marks)**

c. Find all the eigen values and eigen vectors of the matrix
$$A = \begin{bmatrix} -1 & 3 \\ -2 & 4 \end{bmatrix}$$ **(07 Marks)**

2 a. For any two sets A and B, prove that
i) $A - (A \cap B) = A - B$
ii) $A - (A - B) = A \cap B$. **(06 Marks)**

b. Among the integers from 1 to 200, find the number of integers that are
i) Not divisible by 5
ii) Divisible by 2 or 5 or 9
iii) Not divisible by 2 or 5 or 9. **(07 Marks)**

c. State and prove Demorgan laws, distributive laws of set theory. **(07 Marks)**

3 a. State the laws of logic. **(06 Marks)**

b. Prove the following is valid argument:
$$\begin{array}{l} \sim p \leftrightarrow q \\ q \rightarrow r \\ \underline{\sim r} \\ \therefore p \end{array}$$ **(07 Marks)**

c. Negate and simplify each of the followings
i) $\exists x, [p(x) \vee q(x)]$
ii) $\forall x, [p(x) \wedge \sim q(x)]$
iii) $\exists x, [\{p(x) \vee q(x)\} \rightarrow r(x)]$. **(07 Marks)**

4 a. Prove the following logical equivalences without using truth tables:
i) $[p \vee q \vee (\sim p \wedge \sim q \wedge r)] \Leftrightarrow (p \vee q \vee r)$
ii) $[(\sim p \vee \sim q) \rightarrow (p \wedge q \wedge r)] \Leftrightarrow p \wedge q$ **(06 Marks)**

b. Define converse, inverse and contra positive of a conditional $p \rightarrow q$. State the converse, inverse and contrapositive of the conditional. "If a quadrilateral is a parallelogram, then its diagonal bisect each other". **(07 Marks)**

c. Define Tautology; contradiction and contingency, prove that, for any propositions p, q, r the compound proposition $\{p \rightarrow (q \rightarrow r)\} \rightarrow \{(p \rightarrow q) \rightarrow (p \rightarrow r)\}$ is a tautology. **(07 Marks)**

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.