Roll No											

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING
MID TERM EXAMINATION - OCT 2023

Semester : Semester III - 2022
Course Code : MAT2004
Course Name : Sem III - MAT2004 - Discrete Mathematical Structures
Program : B.Tech. Computer Science and Engineering

Date : 3-NOV-2023
Time : 11:30AM - 1:00PM
Max Marks : 50
Weightage : 25%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ALL THE QUESTIONS **(5 X 2 = 10M)**

1. Let p and q be the propositions p : You drive over 65 miles per hour. q : You get a speeding ticket. Write these propositions using p and q and logical connectives (including negations).
   a. You do not drive over 65 miles per hour.
   b. You drive over 65 miles per hour, but you do not get a speeding ticket.
   (CO1) [Knowledge]
2. Find the bitwise OR, bitwise AND of the strings 101 1110, 010 0001.
   (CO1) [Knowledge]
3. State the contrapositive, and the inverse of the conditional statement "If it is raining, then the home team wins."
   (CO1) [Knowledge]
4. The statement "x = y + 3." We can denote this statement by Q(x, y), where x and y are variables and Q is the predicate. Identify the truth values of the propositions Q(1, 2) and Q(3, 0)?
   (CO1) [Knowledge]
5. Identify the scope and bound for the symbolic form (x) (P (x) → Q(x)) .
   (CO1) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS **(4 X 5 = 20M)**

6. Show that $\neg(p \vee q)$ and $\neg p \wedge \neg q$ are logically equivalent by using truth table.
   (CO1) [Comprehension]

7. Show that the proposition $(p \vee q) \leftrightarrow (q \vee p)$ is tautology by using truth table.

(CO1) [Comprehension]

8. Derive the conjunctive normal form of ¬ (p ↔ q)

(CO1) [Comprehension]

9. Show that (∃x) M(x) follows logically from the premises (x)(H(x) → M(x)) and (∃x) H(x).

(CO1) [Comprehension]

PART C

ANSWER THE FOLLOWING QUESTION **(1 X 20 = 20M)**

10. a) Find the principal disjunctive normal form of $(p \rightarrow (q \wedge r)) \wedge (\neg p \rightarrow (\neg q \wedge \neg r))$.

b) " If there was a ball game, then travelling was difficult. If they arrived on time, then travelling was not difficult. They arrived on time. Therefore, there was no ball game." Show that these statements constitute a valid argument.

(CO1) [Application]