H Roll No. .....

TMA–301

B. TECH. (CS/IT) (THIRD SEMESTER) MID SEMESTER EXAMINATION, 2018

DISCRETE MATHEMATICS

Time : 1:30 Hours

Maximum Marks : 50

Note : (i) This question paper contains two Sections.

(ii) Both Sections are compulsory.

Section—A

1. Write True/False : (1×5=5 Marks)

(a) Explain *two* applications of logic in computer.

(b) In how many ways can the letters of the word "PENCIL" be arranged so that N is always next to E ?

(c) For the set A, prove that $A \cap \phi = \phi$.

(True/False)

(d) Define the generalized Pigeon Hole Principle.

(e) The statement $P \vee \{\sim (p \wedge q)\}$ is a contradiction. (True/False)

2. Attempt any *five* parts : (3×5=15 Marks)

(a) Find the total number of ways in which 9 toys of the same type can be distributed among 4 children so that the youngest child gets 3 toys and each of the other get 2 toys.

(b) Explain the laws of inference.

(c) How many arrangements can be made with the letters of the word "MISSISSIPPI" so that two P^S are never together ?

(d) Examine the logical implication of the following statement :

$$[(p \wedge q) \wedge \sim p] \rightarrow q$$

(e) State and prove first law of De-Morgan for sets.

(f) How many automobile license plates can be made if each plate contains two different letters followed by three different digits ?

Section—B

3. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)

(a) Prove by Mathematical induction that :

$$\frac{1}{2} + \frac{1}{2^2} + \frac{1}{2^3} + \ldots\ldots\ldots \frac{1}{2^n} = 1 - \frac{1}{2^n}.$$

(b) 'State the rule of Hypothetical syllogism of logic.' Also prove that it is a valid statement.

(c) Explain quantifiers with example.

4. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)

(a) Give the digits 0, 1, 2, 3, 4, 5. How many three digit different even numbers can be formed if repetition of digits is allowed ?

(b) Prove by Mathematical induction that $\left(x^n - y^n\right)$ is divisible by $(x - y) \forall n \in N$, where x and y are two distinct integers.

(c) Define the symmetric difference of two sets, with an example.

5. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)

(a) Three problems namely A, B and C were given to a class of 80 students. It was found that 30 students solved A, 40 solved B and 50 students solved C. Also 20 students solved A and B, 15 students solved A and C, 25 students solved B and C and 10 students solved all the three. Find the percentage of students who did not solve any problem.

(b) Explain whether the following statement is a tautology :

$$\left[p \rightarrow (q \vee r)\right] \leftrightarrow \left[r \rightarrow p\right]$$

(c) Prove that :

$$^{n}P_{r} = {}^{n-1}P_{r} + r.\,{}^{n-1}P_{r-1}$$