Silicon Institute of Technology

Silicon Hills, Bhubaneswar

| An Autonomous Institute |

3rd Semester B.Tech. Mid Term Examination 2021-22

DISCRETE MATHEMATICS(BTBS-T-PC-015)

Duration: 01:30 Full Marks: 25

1 ***Answer All***

a Find the negation of the statement "All elphents have tusks". 1

b Justify the truth value of the statement $\exists n(n = -n)$ where the universe of discourse consits of all integers. 1

c Show by constructing a truth table that $p \rightarrow q \equiv \neg p \vee q$. 1

d Solve $a_n = a_{n-1} + 2a_{n-3}$ 1

e Write down the form of $a_n^{(p)}$ for a recurrence relation whose characteristic roots are 2, 3, 3 with $F(n) = n + 2^n$. 1

f Give an example of a homogeneous recurrence relation 1

2 ***Answer All***

a Prove that if n is an integer and 3n+2 is even, then n is even. 3

b Define Limit of a real function does not exist using Predicate logic. 3

c Prove that $2^n > n^3 \; for \; n \geq 10$ using induction. 3

3 ***Answer any One***

a Prove by Mathematical Induction that a stamp of Rs8 or more can be formed by using 3 rupees and 5 rupees stamps only. 5

b Using proper symbolization and rules of inference, show that the hypotheses “Mahesh works hard.”, “If Mahesh works hard, then he is a dull boy.” and “If Mahesh is a dull boy, then he will not get the job.” imply the conclusion “Mahesh will not get the job.” 5

4 ***Answer any One***

a Solve the recurrence relation 5

$$a_n = 4a_{n-1} - 4a_{n-2} + (n+1)2^n$$

b Solve the recurrence relation 5

$a_n - 7a_{n-1} + 16a_{n-2} - 12a_{n-3} = 0 \; for \; n \geq 3 \; with \; initial \; conditions \; a_0 = 1, \; a_1 = 4, \; a_2 = 8$