CT-05

1) Write a short note on church Turing Thesis v/s Quantum Computer.
2) Explain the following:
(a) decidability and decidable languages
(b) undecidable languages and Recursive languages

1) church turning theses
it is Stated as any effective Computation or any algorithmic procedure that can be carried out by a human being or a team of human beings or a computer, can be carried out by Some TM

In other words, there is an effective procedure to Solve a decision problem p if and only if there is a TM that answers yes on inputs $w \in P$ and no for $w \notin P$. The church thesis predicts that is unable to Construct models of Computations more powerful then the Existing one.

quantum Computers.
def:- A quantum Computer is a System built from Quantum Computers circuits, Consists of wires and elementary gates
It consists of qubit can be Explained as given below.

$$|\psi\rangle = \alpha|0\rangle + \beta|1\rangle$$

(i) Two possible States are represented as $|0\rangle$ & $|1\rangle$
(ii) unlike classical bit 0 or 1, a qubit Can have infinite number of States eith. rather than $|0\rangle$ & $|1\rangle$ and Can be represented as $|\psi\rangle = \alpha|0\rangle + \beta|1\rangle$
where $|\alpha|^2 + |\beta|^2 = 1$
(iii) In qubits 0 and 1 are called Computational basis States

Scanned with CamScanner

$|\psi\rangle$ is called a Superposition and $|\psi\rangle = \alpha|0\rangle + \beta|1\rangle$ is called quantum State

(iv) In digital Complete data Can be represented as 0

(v) multiple qubits can be difined in Similar way

(vi) Normal NOT gate interchanges 0 and 1 whereas in case of qubit NOT gate, $\alpha|0\rangle + \beta|1\rangle$ is changed to $\alpha|1\rangle + \beta|0\rangle$

2a) decidability: we Say that Turing machine (TM) halts when M reaches a State of q and Current Symbol a to be Scanned.

*) There are TM'S that never halt on Some i/p in an of these ways.

*) There exists a destination b/w the language accepted by TM that halts on all i/p String and TM that never halts on Some i/p String

decidable languages:

A problem with 2 answers (Yes/No) is decidable if the Corresponding language is recursive. In this case, the language 'L' is also called decidable languages.

2b) undecidable Languages:

A problem/language is undecidable if it is not decidable at that case we call it as undecidable languages.

Recursive languages

There is a TM for a language which accept Every String otherwise not.

Consider if L and $\bar{L}$ are Recursive

Let M_1 and M_2 be two TM Such that

$L = T(M_1)$ & $\bar{L} = T(M_2)$

We construct a new two-tape TM that simulates M_1 on one tape and M_2 on another tape

if I/p string $w(m)$ is L, then M_1 accepts w if $w \in \bar{L}$ then M_2 accepts w and we declare m halts without accepting.

By construction of m it is clear that

$T(m) \times T(M_1) = L$

Hence, L is recursive.