Q2.

(i) Halting problem of TM:-

In Computability theory, the halting problem is the problem of determining from a description of the arbitary Computer program and an input, whether the program will finish running, or continue to run forever.

For a program B that might determine if program halt, a "pathological" program g called with an input can pass its own source and its input to B and then specially do the opposite of what B predicts g will do. No B can exists that handle this case. A proof of mathematical definition of Computer and program, which became known as Turing machine.

(ii) Recursive language.

There are two equivalent major definations for the concept of a recursive language:-

a) A recursive formal language is a recursive subset in the set of all possible words over the alphabet of the language.

b) A recursive language is a formal language for which there exists a turning machine that, when present with any finite input string, halts & accept if the string is in the language & halts & reject otherwise.

(iii) Variety of turning machine

(a) multiple track turning machine

(b) Two-way infinite tape turning machine

(c) Multi-tape turning machine

(d) Multi-tape Multi-head turning machine

(e) Multi-dimentional tape turning machine

(f) Multi-head turning machine

(g) Non-deterministic turing machine.