**Module 5: Undecidability**

Variants of Turing Machines (TM), The model of Linear Bounded automata: Decidability: Definition of an algorithm, decidability, decidable languages, 10 Hours Undecidable languages, halting problem of TM, Post correspondence problem. Complexity: Growth rate of functions, the classes of P and NP, Quantum Computation: quantum computers, Church-Turing thesis.

1. Write Short notes on

a) Recursive language and its relationship with RE and non-RE languages**.(5M)(Dec14)**

b) Halting Problem of TM(**5M)(Jun13,Dec16,18,Jan20)**

1. Write a note on multitape turing machine.

(**5M)(Dec10,14,16,18,Jun13,16,19,Jan,Sep20,Feb21)**

1. Write a note on non deterministic turing machine.

(**5M)(Dec14,15,18,Jun13,18,Sep20,Feb21)**

1. Show that ADFA is decidable. **(5M)(Jul22)**
2. Prove the ATM is undecidable. **(5M)(Jul22)**
3. Write a note on Undecidable languages. (**5M) (Dec17)**
4. Write a note on post correspondence problem (**5M) (Dec17)**
5. Explain the model of Linear Bounded Automata. **(5M)(Jan20)**
6. Prove that every language accepted by a multitape TM is acceptable by some standard TM. **(6M) (Jan20,Feb21)**
7. Explain the post correspondence problem. (**5M) (Jun13,14,15,16,Dec14,15,16,18,Jan,Sep20,Feb21,Aug21)**
8. Definepost correspondence problem(PCP). Does the PCP with two list x=(b, bab3, ba) , y=(b3, ba, b) have a solution. **(8M)(Jul22)**
9. Does the PCP with two list x=(0,01000,01), y=(000,01,1) have a solution. **(5M)(Jul22)**
10. P.T If L is a recursive language, L is also recursive**. (10M)( Jun/Jul10)**
11. Write Shortnotes on
    * + - 1. Recursively enumerable languages**(5M)(Jun15)(Dec18,Sep20,Feb22)**
          2. Recursive Languages. (**5M)(Jun13,14,15,Dec16,Feb21)**
          3. Decidable languages **(4M)(Dec18)**
12. P T compliment of a recursively enumerable language is recursive.(**6M) (Dec12)**
13. Write applications of Turing Machine. **(6M)(Feb22)**
14. Define non-deterministic TM and Prove that there is a deterministic TM ‘M’ such that T(M)=T(M1). **(10M)(Jan20)**
15. Prove that HALTTM = {(M,W)| the Turing machine M halts on input W} is undecidable. **(4M)(July18,Sep20)**
16. With example, explain the quantum computation. **(4M)(July18,Feb/Jul22)**
17. Explain briefly the Halting problem. **(6m)(Dec/Jan10)(Dec16,18,Jan,Sep20,Aug21,Feb22)**
18. With a neat diagram, explain variants of Turing machine. **(10M)(Jan20,Aug21)**
19. Prove that “The growth rate of any exponential functional is greater than that of any polynomial. **(8M)(Sep20)**
20. Define the following i) Quantum Computer ii) Class NP iii) Church Turing Thesis **(6M) (Dec18)(July19,Sep20,Aug21)**
21. Explain P and NP classes. **(7M)(Feb22)**
22. Write a short note on: **(20m) Dec/Jan12)(Jul15)**

a. Undesirability

1. Halting problem**. (July19)**
2. Decidability. **(Jan20)**
3. Growth rate of function**.(July19)**
4. Decidable languages **(Jan,Sep20)**
5. Undecidable languages**. (Jan20)**
6. Church Turing Thesis **(Jan,Sep20,Feb/Jul22)**
7. The model of linear bounded automaton. **(Dec17, July19,Jan,Sep20,Feb21)**
8. Various types of Turing Machine. **(July19)**