Branch : CSE & IT

Batch : Hinglish

Theory of Computation

Undecidability & Decidability I

DPP 01

[MCQ]

1. Consider the following statements?

S_1: For any problem if TM exist then problem may be decidable.

S_2: For any problem if TM not exit then problem may be decidable.

Which of the following is correct?

(a) S_1 only

(b) S_2 Only

(c) Both S_1 and S_2

(d) None of these

[MSQ]

2. Which of the following is / are true about CYK algorithm?

(a) CYK is a bottom up parsing algorithm.

(b) CYK algorithm will take $O(n^3)$ time to verify n – length string.

(c) CYK is a dynamic programing algorithm.

(d) CYK algorithm is used to whether given string is a member of the language or not?

[MCQ]

3. In which of the following machine, halting problem is not decidable?

(a) Finite automata.

(b) Linear bound automata.

(c) Deterministic push down automata.

(d) None of these.

[MCQ]

4. Consider the following Statements:

(i) Non – disjointness problem is decidable for regular expression.

(ii) Totality problem for DPDA is decidable.

(iii) Every decidable problem is also semidecidable.

Which of the following is correct?

(a) (ii) and (iii) only.

(b) (i) and (ii) only.

(c) (iii) only.

(d) All are correct.

[MCQ]

5. Which of the following is decidable to turing machine?

(a) Halting problem.

(b) Blank tape halting problem.

(c) RE membership problem.

(d) None of these.

[MCQ]

6. Consider the following statement:

S_1: In turing machine every final state is dead.

S_2: In turing machine every non – final state may be dead.

Which of the following is correct?

(a) S_1 only

(b) S_2 Only

(c) Both S_1 and S_2

(d) None of these

[MCQ]

7. Which of the following is not correct?

(a) Every semidecidable language is RE.

(b) If language is NOT even semidecidable, then it must be NOT RE.

(c) If language is undecidable then it may be RE.

(d) If a language is semidecidable but not decidable then it may be Recursive.

[MSQ]

8. Which of the following is / are correct?

(a) A language 'L' is semidecidable iff there exist a turing machine which accept 'L'.

(b) A language 'L' is decidable iff there exist a turing machine which accept L and which halts $\forall w \varepsilon \in *$.

(c) A language is decidable iff there exist an algorithm.

(d) None of these.

Answer Key

1. **(c)**
2. **(a, b, c, d)**
3. **(d)**
4. **(d)**
5. **(d)**
6. **(c)**
7. **(d)**
8. **(a, b, c)**

Hint & Solutions

1. (c)

- For any problem TM (RE) exist then problem may be decidable because, for the problem may be HTM exist.
- May be HTM exist: so it may be decidable

Hence, both statements are correct.

2. (a, b, c, d)

- CYK algorithm will tell whether given string is member or not.
- CYK is bottom up parsing algorithm.
- To verify n – length string CYK algorithm will take $O(n^3)$ time. It's also called as dynamic programming.

3. (d)

Halting problem is decidable for FA, DPDA, PDA and LBA (HTM).

4. (d)

- Disjoint ness problem is decidable for DFA / NFA / Regular. $(\text{Disjointness})^C$ = Non – disjointness
- Totality problem for DPDA is decidable.
- Decidable → Recursive

  Semi decidable → Recursive, RE also.

  All decidable are semidecidable.

5. (d)

Halting problem, Blank tape halting problem, state entry problem, post correspondence problem (PCP), modified PCP and RE membership all are undecidable to turing machine.

6. (c)

In turing machine there is no temporary final state like NFA / DFA. TM sees the entire string and check whether it is accepts or reject.

In TM every final state is dead i.e true.

Every non – final state may be dead or may not be dead i.e true.

7. (d)

(a) RE → Semidecidable.

(b) Not RE → Not even semidecidable.

(c) Decidable → Rec

Recursive → RE

(d) Semidecidable but not decidable → RE but not recursive

Hence, option (d) is false.

8. (a, b, c)

All statement are correct.