



TOC Unit 4-TM MCQ Qb - bdbd

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STQA Unit-4 MCQ Turing Machine

1. The language recognized by Turing machine is:

- (A) Context free language
- (B) Context sensitive language
- (C) Recursively enumerable language
- (D) Regular language

Ans: c

Explanation: A language is recursively enumerable (generated by Type-0 grammar) if it is accepted by a Turing machine. A TM decides a language if it accepts it and enters into a rejecting state for any input not in the language. A language is recursive if it is decided by a Turing machine.

2. Turing machine consist of:

- (A) Input tape
- (B) Blank symbol
- (C) Tape head
- (D) All of these

Ans: d

Explanation: TM consist of number of states, input alphabet, tape head, blank symbol,

3. Turing machine is more powerful than:

- (A) Finite automata
- (B) Push down automata
- (C) Both (a) and (b)
- (D) None of these

Ans: c

Explanation: Turing machines are more powerful because they can remember more than FA because FA don't have memory to remember. Turing machines are indeed more powerful than regular PDAs because it can simulate the TM's tape using two stacks: in the left stack everything is stored which is left from the head on the Turing-tape, while the symbol under the head and everything right from the head is stored in the other stack.

4. Alan Turing introduced Turing machine late in

- (A) 1936
- (B) 1938
- (C) 1940
- (D) 1935

Ans: b

Explanation: The Turing machine was invented in 1938 by Alan Turing, who called it an "a machine"

5. In definition of TM $T = (Q, \Sigma, \Gamma, q_0, \delta)$ what Γ represents?

- (A) Tape alphabets
- (B) Input symbols
- (C) Transition function
- (D) Initial state

Ans: a

Explanation: Γ represents a tape alphabet which is nothing but output symbol

6. In one move the Turing machine:

- (A) May change its state
- (B) May write a symbol on the cell being scanned.
- (C) May move the head one position left or right
- (D) All of the above

Ans: d

Explanation: TM tape head can move the head position left or right, change its state and while moving input symbols on cell being scanned (Read)

7. Halting state of Turing machine are:

- (A) Start and stop
- (B) Accept and reject
- (C) Start and reject
- (D) Reject and allow

Ans: b

Explanation: In TM, machine can halt on if string is accepted with correct output or rejected with wrong output

8. Which of the following is an extension to the basic model of Turing machine:

- (A) Multi tape Turing machine
- (B) Multi head Turing machine
- (C) Nondeterministic Turing machine
- (D) All of the above

Ans: d

Explanation: Extension of TM are Multi tape Turing machine, Multi head Turing machine, Nondeterministic Turing machine, Deterministic Turing machine, Multi-stack TM

9. Why Turing machine is more powerful than Finite automata?

- (A) Turing machine head movement is continued to one direction.
- (B) Turing machine head movement is in both directions
- (C) Turing machine has capability to remember arbitrary long sequence of input string.
- (D) All are correct

Ans: c

Explanation: Turing machine has capability to remember arbitrary long sequence of input string and In FA there is no memory for storage

10. A pushdown automata behaves like a Turing machine, when it has number of auxiliary memory.

- (A) 0
- (B) 2
- (C) 2 or more
- (D) Both b and c

Ans: c

Explanation: A pushdown automaton behaves like a Turing machine when the number of auxiliary memory is 2. The machines are actually represented using the 3r elements of the alphabet. In this term, the letter is the number of registers

11. Universal Turing machine (UTM) influenced the concepts of

- (A) Computability
- (B) Interpretive implementation of programming language
- (C) Program and data is in same memory
- (D) All are correct

Ans: d

Explanation: all above 3 options are suitable for UTM

12. A universal Turing machine is a

- (A) Single tape Turing machine
- (B) Two-tape Turing machine
- (C) Reprogrammable Turing machine
- (D) None of them

Ans: c

Explanation: UTM is a reprogrammable TM, other 2 are types of TM

13. A Turing machine that is able to simulate other Turing machines:

- (A) Nested Turing machines
- (B) Multi tap Turing machine
- (C) Universal Turing machines
- (D) None of these

Ans: c

Explanation: A Turing machine that is able to simulate any other Turing machine is called a universal Turing machine (UTM, or simply a universal machine).

14. A Turing machine with several tapes is known as:

- (A) Multi-tape Turing machine
- (B) Universal Turing machine
- (C) Poly-tape Turing machine
- (D) All of the mentioned

Ans: a

Explanation: A multitape Turing machine is an ordinary Turing machine with multiple tapes. Each tape has its own head to control the read and write.

15. A multitape Turing machine is _____ powerful than a single tape Turing machine. (A) more

- (B) less
- (C) equal
- (D) none of the mentioned

Ans: a

Explanation: The multitape Turing machine model seems much more powerful than the single tape model, but any multi tape machine, no matter how many tapes, can be simulated by single taped TM.

16. Which of the following is true for two stack Turing machines?

- (a) one read only input
- (b) two storage tapes

- (c) Both (a) and (b)
- (d) None of the mentioned

Answ: c

Explanation: Two-stack Turing machines have a read-only input and two storage tapes. If a head moves left on either tape a blank is printed on that tape, but one symbol from a "library" can be printed.

17. A deterministic turing machine is:

- (a) ambiguous turing machine
- (b) unambiguous turing machine
- (c) non-deterministic
- (d) none of the mentioned

Ans: b

Explanation: A deterministic turing machine is unambiguous and for every input, there is exactly one operation possible. It is a subset of non-deterministic Turing machines.

18. Which of the following is true about Turing's a-machine?

- a) a stands for automatic
- b) left ended, right end-infinite
- c) finite number of tape symbols were allowed
- d) all of the mentioned

Ansr: d

Explanation: Turings a- machine or automatic machine was left ended, right end infinite. Any of finite number of tape symbols were allowed and the 5 tuples were not in order.

19. State true or false:

Statement: Multitape turing machine have multi tapes where each tape is accessed with one head.

- a) true
- b) false

Ans: b

Explanation: Multitape turing machines do have multiple tapes but they are accessed by separate heads.

20. Are Multitape and Multitrack turing machines same?

- a) Yes
- b) No
- c) Somewhat yes
- d) Cannot tell

Ans: a

Explanation: Multitrack turing machines are special types of Multitape turing machines. In a standard n-tape Turing machine, n heads move independently along n-tracks.

21. Which of the following does not exist?

- a) Turing Machine with Multiple heads
- b) Turing Machine with infinite tapes
- c) Turing machine with two dimensional tapes
- d) None of the mentioned

Ans: d

Explanation: All of the mentioned are one or the other kind of Turing machines in existence.

22. Which of the following is/are a basic TM equivalent to?

- a) Multitrack TM
- b) Multitape TM
- c) Non-deterministic TM
- d) All of the mentioned

Ans: d

Explanation: Tms can be used as both: language recognizers/Computers. TMs are like universal computing machines with universal storage.

23. Which of the following is/are not an application of turing machine?

- a) Language Recognition
- b) Computers of functions on non negative numbers
- c) Generating devices
- d) None of the mentioned

Answer: d

Explanation: A turing machine can have many applications like : Enumerator (A turing machine with an output printer), function computer, etc.

24. Which among the following is not true for 2-way infinite TM?

- a) tape in both directions
- b) Leftmost square not distinguished
- c) Any computation that can be performed by 2-way infinite tape can also be performed by standard TM.
- d) None of the mentioned

Ans: d

Explanation: All of the mentioned are correct statements for a two way infinite tape turing machine. Theorems say the power of such a machine is in no way superior than a standard turing machine.

25. Which of the functions can a turing machine not perform?

- a) Copying a string
- b) Deleting a symbol
- c) Accepting a pal
- d) Inserting a symbol

Answer: d

Explanation: Different turing machines exist for operations like copying a string, deleting a symbol, inserting a symbol and accepting palindromes.

26. If T1 and T2 are two turing machines. The composite can be represented using the expression:

- a) T_1T_2
- b) $T_1 \cup T_2$
- c) $T_1 \times T_2$
- d) None of the mentioned

Answer: a

Explanation: If T1 and T2 are TMs, with disjoint sets of non halting states and transition function δ_1 and δ_2 , respectively, we write T_1T_2 to denote this composite TM.

27. A turing machine that is able to simulate other turing machines:

- a) Nested Turing machines
- b) Universal Turing machine
- c) Counter machine
- d) None of the mentioned

Answer: b

Explanation: A more mathematically oriented definition with the same universal nature was introduced by church and turing together called the Church-Turing thesis(formal theory of computation).

28. Which of the problems are unsolvable?

- a) Halting problem
- b) Boolean Satisfiability problem
- c) Both (a) and (b)
- d) None of the mentioned

Answer: c

Explanation: Alan turing proved in 1936 that a general algorithm to solve the halting problem for all possible program-input pairs cannot exist.

29. Which of the following a turing machine does not consist of?

- a) input tape
- b) head
- c) state register
- d) none of the mentioned

Answer: d

Explanation: A state register is one which stores the state of the turing machine, one of the finitely many. Among these is the special start state with which the state register is initialized.

30. The value of n if turing machine is defined using n-tuples:

- a) 6
- b) 7
- c) 8
- d) 5

Answer: b

Explanation:

The 7-tuple definition of turing machine: $(Q, \Sigma, \Gamma, q_0, \delta, B, F)$

where Q = The finite set of states of finite control

Σ = The finite set of input symbols

Γ = The complete set of tape symbols

δ = The transition function

q_0 = The start state, a member of Q , in which the finite control is found initially. B = The blank symbol

F = The set of final or accepting states, a subset of Q .

31. If δ is not defined on the current state and the current tape symbol, then the

machine _____

- a) does not halts
- b) halts
- c) goes into loop forever
- d) none of the mentioned

Answer: b

Explanation: If we reach h_A or h_R , we say TM halts. Once it has halted, it cannot move further, since d is not defined at any pair (h_A, X) or (h_R, X) where h_A = accept halting state and h_R = reject halting state.

32. A turing machine is a

- a) real machine
- b) abstract machine
- c) hypothetical machine
- d) more than one option is correct

Answer: d

Explanation: A turing machine is abstract or hypothetical machine thought by mathematician Alan Turing in 1936 capable of simulating any algorithm, however complicated it is.

33. A turing machine operates over:

- a) finite memory tape
- b) infinite memory tape
- c) depends on the algorithm
- d) none of the mentioned

Answer: b

Explanation: The turing machine operates on an infinite memory tape divided into cells. The machine positions its head over the cell and reads the symbol.

34. Which of the functions are not performed by the turing machine after reading a symbol?

- a) writes the symbol
- b) moves the tape one cell left/right
- c) proceeds with next instruction or halts
- d) none of the mentioned

Answer: d

Explanation: After the read head reads the symbol from the input tape, it performs the following functions:

- a) writes a symbol(some model allow symbol erasure/no writing)
- b) moves the tape left or right (some models allows no motion)
- c) proceeds with subsequent instruction or goes either into accepting halting state or rejecting halting state.

35. 'a' in a-machine is :

- a) Alan
- b) arbitrary
- c) automatic
- d) None of the mentioned

Answer: c

Explanation: The turing machine was invented by Alan Turing in 1936. He named it as a machine(automatic machine).

36. The ability for a system of instructions to simulate a Turing Machine is called

- _____ a) Turing Completeness
b) Simulation
c) Turing Halting
d) None of the mentioned

Answer: a

Explanation: Turing Completeness the ability for a system of instructions to simulate a Turing machine. A programming language that is Turing complete is theoretically capable of expressing all tasks accomplishable by computers; nearly all programming languages are Turing complete.

37. Turing machine can be represented using the following tools:

- a) Transition graph
b) Transition table
c) Queue and Input tape
d) All of the mentioned

Answer: d

Explanation: We can represent a turing machine, graphically, tabularly and diagrammatically.

38. Which of the following is false for an abstract machine?

- a) Turing machine
b) theoretical model of computer
c) assumes a discrete time paradigm
d) all of the mentioned

Answer: d

Explanation: An abstract machine also known as abstract computer, is a theoretical model of computer or hardware system in automata theory. Abstraction in computing process usually assumes a discrete time paradigm.

39. Statement 1: Multitrack Turing machine.

Statement 2: Gamma is Cartesian product of a finite number of finite sets. Which among the following is the correct option?

- a. Statement 1 is the assertion and Statement 2 is the reason
b. Statement 1 is the reason and Statement 2 is the assertion
c. Statement 1 and Statement 2 are independent from each other
d. None of the mentioned

Answer: (a).

Explanation: Statement 1 is the assertion and Statement 2 is the reason

40. Using a two track tape, we can use a semi infinite tape to simulate an infinite tape a) true

- b) False

Answer: a

Explanation: A TM with semi-infinite tape means that there are no cells to the left of the initial head position. A TM with semi-infinite tape simulates a TM with an infinite tape by using a two track tape.

41. Which of the following problems is solvable ?

- a) Writing a universal Turing machine

- b) Determining of an arbitrary turing machine is an universal turing machine c)
Determining of a universal turing machine can be written for fewer than k instructions for some k d) Determining of a universal turing machine and some input will halt

Answer: a

Explanation: writing UTM is a solvable , remaining are unsolvable problems

42. The statement, "A TM can't solve halting problem" is

- a) True
- b) false
- c) all of these

Ans: a

Explanation: Halting problem - Deciding whether a given TM halts for a given string - undecidable but semidecidable.

Non-halting problem - Deciding whether a given TM does not halt for a given string - complement of above problem - undecidable and not even semi-decidable.

43. If there exists a TM which when applied to any problem in the class, terminates, if correct answer is yes and may or may not terminate otherwise is called

- a) stable
- b) unsolvable
- c) partially solvable
- d) unstable

Ans: c

Explanation: If there exists a TM which when applied to any problem in the class, terminates, if correct answer is yes and may or may not terminate otherwise is called partially solvable

44. **A turing machine that is able to simulate other turing machines:**

- a) Nested Turing machines
- b) Universal Turing machine
- c) Counter machine
- d) None of the mentioned

Ans: b

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45 Post Correspondence problem is

- a) decidable decision problem
- b) undecidable decision problem
- c) not a decision problem
- d) none of the mentioned

Ans: b

Explanation: Post Correspondence problem is an undecidable decision problem that was introduced by Emil Post in 1946. Being simpler than halting problem, it can be used in proofs of undecidability.

46. State true or false:

Statement: The difference between PCP and MPCP is that in MPCP, a solution is required to start with the first string on each list.

- a) true
- b) false

Ans: a

Explanation: The MPCP is : Given lists A and B of K strings ,say $A = w_1, w_2, \dots, w_k$ and $B = x_1, x_2, \dots, x_k$ does there exists a sequence of integers i_1, i_2, \dots, i_r such that $w_{i_1}w_{i_2}\dots w_{i_r} = x_{i_1}x_{i_2}\dots x_{i_r}$?

47. Consider three decision problem A, B, C. A is decidable and B is not. Which of the following is a correct option?

- a) C is undecidable if C is reducible to B
- b) C is undecidable if B is reducible to C
- c) C is decidable if A is reducible to C
- d) C is decidable if C is reducible to B's complement.

Ans: b

Explanation: As B is undecidable and it can be reduced to C, C is also an undecidable problem.

48. The ability for a system of instructions to simulate a Turing Machine is called _____

- a) Turing Completeness
- b) Simulation
- c) Turing Halting
- d) None of the mentioned

Ans: a

Explanation: Turing Completeness the ability for a system of instructions to simulate a Turing machine. A programming language that is Turing complete is theoretically capable of expressing all tasks accomplishable by computers; nearly all programming languages are Turing complete.

49. Turing machine can be represented using the following tools:

- a) Transition graph
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- d) All of the mentioned

Ans: d

Explanation: We can represent a turing machine, graphically, tabularly and diagrammatically.

50. If d is not defined on the current state and the current tape symbol, then the machine _____

- a) does not halts
- b) halts
- c) goes into loop forever
- d) none of the mentioned

Ans: b

Explanation: If we reach h_A or h_R , we say TM halts. Once it has halted, it cannot move

further, since d is not defined at any pair (h_A, X) or (h_R, X) where h_A = accept halting state and h_R = reject halting state.