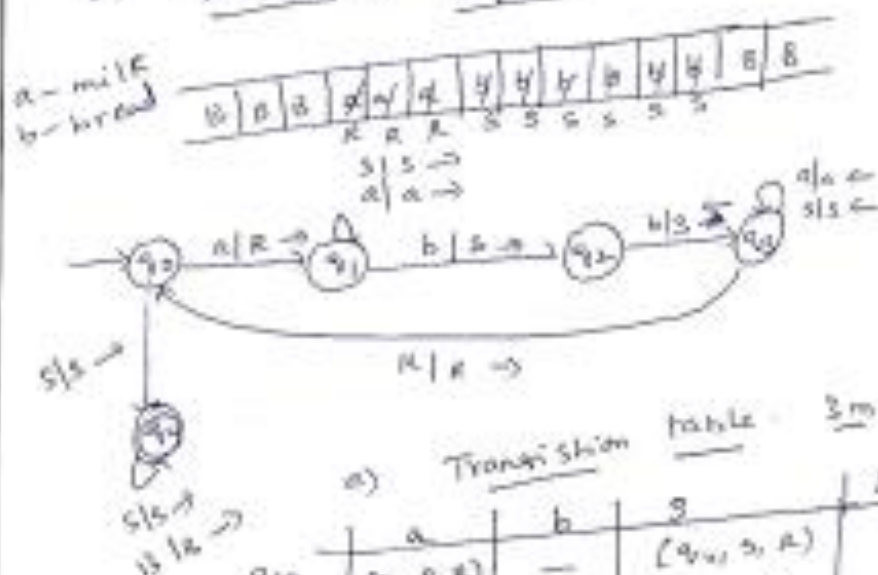


- a) Turing Machine (TM) tape head can move in left, right, up or down direction in
- Multi-tape TM
  - Multi-head TM
  - Multi-track TM
  - Multi-dimensional TM
- b) A: The Machine Halts when there is no possible transition to follow  
B: The TM final state has an outgoing transition  
Which of the following is true ?
- A and B are true
  - A and B are false
  - A is true and B is false
  - A is false and B is true
- c) Generate the accepting language L for the given scenario. Jay visits a store to buy some gallon of milk and bread. First she buys milk followed by bread, which is twice the quantity of milk. Design a TM for the generated language
- d) Draw a transition diagram and Transition table of the constructed TM
- e) Is it a Computing device or an acceptor. Justify the answer  
Simulate a TM for MilkMilkBreadBreadBread

Set 2

Q1:

- a) 34 - multi dimensional Tm - master  
 b) iii - A is true and B is false - master  
 c)  $L = \{ a^n b^{2n} \mid n \geq 1 \}$  - 3m  
 d) Transition diagram - 5m



a) Transition table - 3m

	a	b	S	R	B
q0	(q1, R, R)	-	(q1, S, R)	-	-
q1	(q1, a, R)	(q2, S, R)	(q1, S, R)	-	-
q2	-	(q3, S, L)	-	-	-
q3	(q3, a, L)	-	(q3, S, L)	(q0, R, R)	-
q4	-	-	(q4, S, R)	-	(q4, B, R)

— 1990

- 3 maska

27. The machine accepts all the language even though they are countably enumerable. Recursive means repeating the same set of rules for any no. of times and enumerable means a set of elements.

3. Milk Milk Bread Bread Bread - 9m

( $a_{10}$ , milk milk bread bread bread) +

(with regular with bread used bread) for

(A with 9, with bread bread tree) +

(2 milk 5  $9\frac{1}{2}$  bread bread)  $\leftarrow$  9 miles

(2 mill  $\frac{3}{4}$  @ 3 bread) +

(2 with 93 SS bread) +

(R 90 mill SS thread) +

(RR ♀, SS breed) +

(RR 54% breed) +

(RR  $\rightarrow$  bread) +

(RH SS 892) +

$q_1$  is not final state  
 Hence the given string  
 is not accepted

Scanned with CamScanner

An UPI based online payment application wishes to attract new customers. In this perspective, it has decided to give a reward of Rs 5 for every transaction made to the sender as well as the receiver of the amount.

- a) The Turing machines are brain child of \_\_\_\_\_  
i) **Programming languages**  
ii) Microprocessors

iii) Stored program concept

iv) Microcontrollers

b) If MPCP can be solved then PCP can also be solved. Which property illustrates this?

i) Computational complexity

ii) **Decidability**

iii) Reducibility

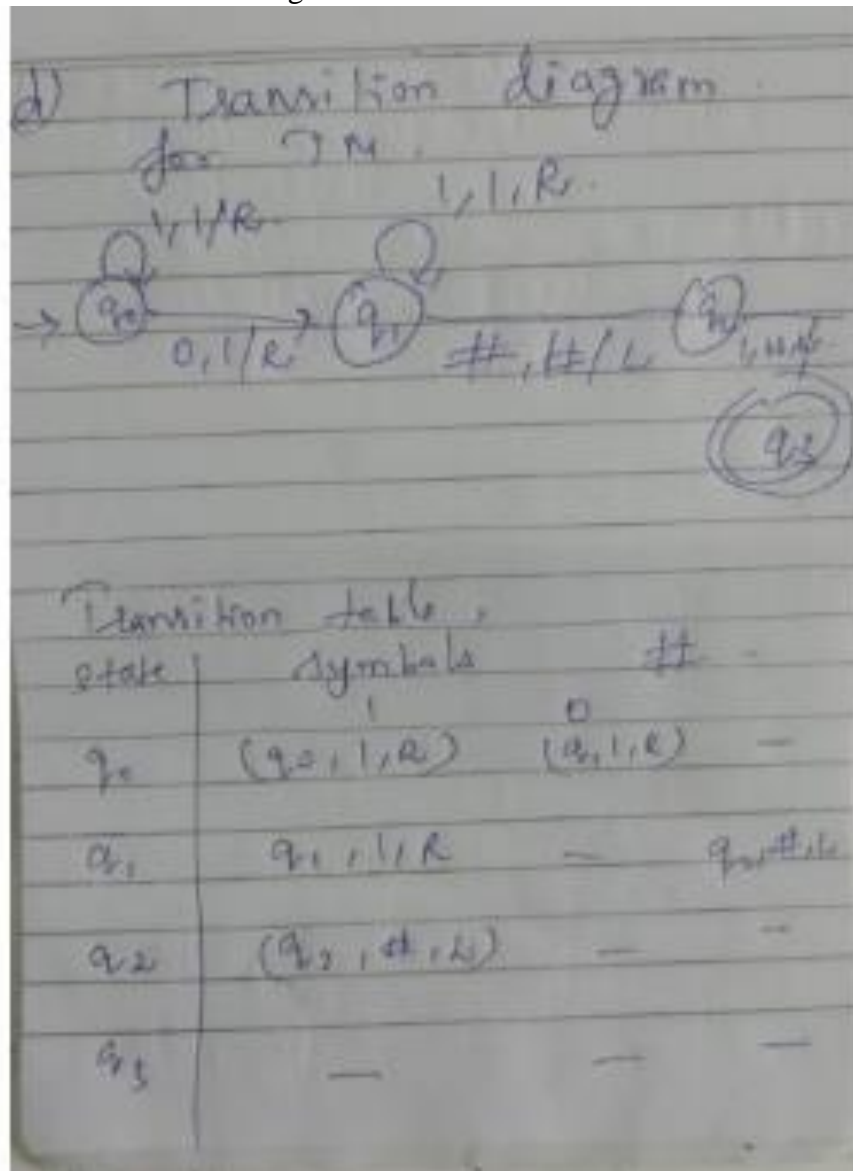
iv) Computability

c) Construct a TM transition rules that calculates the total amount of the receiver (including reward).

c) The TM compute for  $A+5$  in following order  
e.g let  $A=2$  so we need to compute  $2+5$ .  
 $\#11\#\# = 2$   
 $\#11111\#\# = 5$   
 $\#1101111\# = 2+5$   
↓  
delimiter that separates the two different value on the tape.

$\#1101111\#$  move right upto 0 sign  
 $\#11111\#$  convert 0 to 1 and move right  
 $\#111111\#$  Move right  
 $\#111111\#$  Move right  
 $\#111111\#$  # encountered so just move left.  
 $\#111111\#$  Convert 1 to  
 $\#111111\#\#$  thus the new config of the addi

- d) Draw the transition diagram and table for the same



- e) Compute the total amount at the receiver if the actual transaction is Rs 6. Illustrate it using instantaneous description

e) Given  $A = 6$  as we have to compute  $6 + 5$  consider the input tape

1	1	1	1	1	1	0	1	1	1	1	1	1	#	#	#
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

The instantaneous description will be —

$q_0$  1 1 1 1 1 1 0 1 1 1 1 1 # | —  $q_1$  1 1 1 1 1 0 1 1 1 1 1 #

| —  $q_2$  1 1 1 1 0 1 1 1 1 1 # | —  $q_3$  1 1 1 1 0 1 1 1 1 #

| —  $q_4$  1 1 1 1 0 1 1 1 1 1 # | —  $q_5$  1 0 1 1 1 1 1 #

| —  $q_6$  1 1 1 1 1 1 1 1 1 # | —  $q_7$  1 1 1 1 1 1 1 1 1 #

| —  $q_8$  1 1 1 1 1 1 1 1 1 # | —  $q_9$  1 1 1 1 1 1 1 1 1 #

| —  $q_{10}$  1 1 1 1 1 1 1 1 1 # | —  $q_{11}$  1 1 1 1 1 1 1 1 1 #

| —  $q_{12}$  1 1 1 1 1 1 1 1 1 # | —  $q_{13}$  1 1 1 1 1 1 1 1 1 #

| —  $q_{14}$  1 1 1 1 1 1 1 1 1 # | —  $q_{15}$  1 1 1 1 1 1 1 1 1 #

Thus, the result is 11.

f) Binary encoding of TM —

T-tuple representation of TM with

which on the tape:

Encode the constructed TM in binary language and then decode them. (6 marks)

$$\begin{aligned}
 & \left\{ (q_0^I, q_1^I, q_2^I, q_4^I), (0, 1), (0, 1, \#), \right. \\
 & \left( \delta(q_0^I, 1) \rightarrow (q_0^I, 1, R), \delta(q_0^I, 0) \rightarrow (q_1^I, 1, R), \right. \\
 & \left. \delta(q_1^I, 1) \rightarrow (q_1^I, 1, R), \delta(q_1^I, 0) \rightarrow (q_2^I, 1, R), \right. \\
 & \left. \delta(q_2^I, 1) \rightarrow (q_2^I, 1, R), \delta(q_2^I, 0) \rightarrow (q_4^I, \#, L), \right. \\
 & \left. \delta(q_4^I, \#) \rightarrow (q_4^I, \#, L) \right\}, q_0^I, \#, \\
 & q_4^I \} \text{ [Decoded form of TM]}
 \end{aligned}$$

The binary encoded form is

$$\begin{aligned}
 M = & \left\{ \begin{array}{ccccccc}
 1 & 0 & 1 & 1 & 0 & 1 & 1 & 1 & 1 & 1 & 0 & 0 & 1 & 0 & 1 & 1 & 1 & 0 & 1 \\
 \hline
 & \delta_0 & & & & & \Sigma & & & & & & & & & & & \Gamma \\
 0 & 0 & 1 & 0 & 1 & 1 & 0 & 1 & 0 & 1 & 1 & 0 & 1 & 1 & 0 & 1 & 1 & 0 & 1 \\
 \hline
 & \delta_1 & & & & & \delta_2 & & & & & & & & & & & \\
 1 & 1 & 0 & 1 & 1 & 0 & 1 & 1 & 0 & 1 & 1 & 0 & 1 & 1 & 0 & 1 & 1 & 1 & 0 \\
 \hline
 & \delta_3 & & & & & \delta_4 & & & & & & & & & & & \\
 0 & 1 & 1 & 1 & 0 & 1 & 1 & 0 & 1 & 1 & 1 & 0 & 1 & 1 & 1 & 0 & 1 & 1 & 0 \\
 \hline
 & \delta_5 & & & & & q_0 & & & & & \# & & & & & & \\
 1 & 1 & 1 & 1 & 1 & & & & & & & & & & & & & \\
 \hline
 & q_4 & & & & & & & & & & & & & & & & 
 \end{array} \right\}
 \end{aligned}$$

Scanned with CamScanner

Every year a common festival is celebrated between two villages A and B. On an account of this, a local sport is organized by the villagers. The selection of players in this year happens according to the given table (Here 0 indicates women and 1 indicates men). The positioning of the players is made in such a way that at any particular position, if village A places a set of players from set i, then village B should also place the set of players from set I only. This pattern will repeat for other sets also.

i	A	B
1	11	10110
2	111	000
3	001	0101
4	010	0

- a) Consider the statements:  
 S1: All recursively enumerable languages are countable.  
 S2: Set of all non-regular languages over the alphabet  $\{a,b,c\}$  is recursively enumerable.
- Both are true**
  - Only S1 is true
  - Only S2 is true
  - Both are false
- b) A NP complete problem is the conjunction of \_\_\_\_\_
- NP hard and NP**
  - NP and P
  - NP hard and P
  - NP hard alone
- c) An audience claims that there are atleast two ways in which the men and women of villages A and B can be placed after fulfilling the condition of the game. Is this true? If yes, give the sequence.
- d) Assuming the above given table is a MPCP problem, convert it into PCP.
- e) Construct a TM, for another game in which if village A places men then village B should place woman and vice versa. Design a TM to help village B in doing so.

Find the arrangement of village B if the village A places players in the following order:  
 “men, women, women, men”.