(a) **Yes.** A Turing machine can write the blank symbol ▯ on its tape.

According to the definition, a Turing machine is a 7 – tuple $(Q, \Sigma, \Gamma, \delta, q_0, q_{accept,} q_{reject})$

Where Q, Σ, Γ are all finite sets.

Σ is the input alphabet not containing the blank symbol ▯ .

But Γ is the tape alphabet, where ▯ $\in \Gamma$ and $\Sigma \subseteq \Gamma$.

A Turing machine can write any characters in Γ on its tape.

Thus Turing machine can write blank symbol on its tape.

(b) **No.** The tape alphabet Γ never same as input alphabet Σ

Because tape alphabet Γ contains blank symbol ▯ where as input alphabet does not contain blank symbol.

Always Σ is subset of Γ, but never same as Σ.

(c) **Yes.** Turing machines head be in the same location in two successive steps.

When the Turing machines head is at the left _end of the tape, if Turing machine again try to move left side then Turing machine's head is in the same location as previous can move.

(d) **No.**

According to definition, A Turing machine is a 7- tuple ($(Q, \Sigma, \Gamma, \delta, q_0, q_{accept}, q_{reject})$

Where Q is the set of states.

q_{accept} is the accept state and is belongs to Q

q_{reject} is the reject state and is belongs to Q.

But $q_{accept} \neq q_{reject}$

Thus there must be two distinct states q_{accept} and q_{reject}

So, a Turing machine contains at least two states.

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