DHARMSINH DESAI UNIVERSITY, NADIAD
FACULTY OF TECHNOLOGY
ONLINE SESSIONAL EXAMINATION

BTECH (CE) Sem 6
SUBJECT: TAFL

Roll-No: CE047 | Date: 4/1/22
Sign: | Time: 11:00 AM

Q-1) Do as directed

a) i) {{0}, {0,1}, {0,1,2} ....}

$\{ \{ i \mid 0 \le i \le 2^{n-1}, i \in N \}, n \in N \}$

ii) {ac, bc, abbccc, aabccc}

Hence the expression must be

$\boxed{\{ a^n b^i c^m,\ n \ge 0,\ m \ge 0,\ i \ge 0 \}}$

~~So the answer is~~ $\boxed{\cancel{[a^*(b+\lambda)c^*]}}$

b). $L_1 = \{a\}$
$L_2 = \{b\}$

$L_1^* = \{\lambda, a, aa, aaa, \ldots\}$
$L_2^* = \{\lambda, b, bb, bbb \ldots\}$

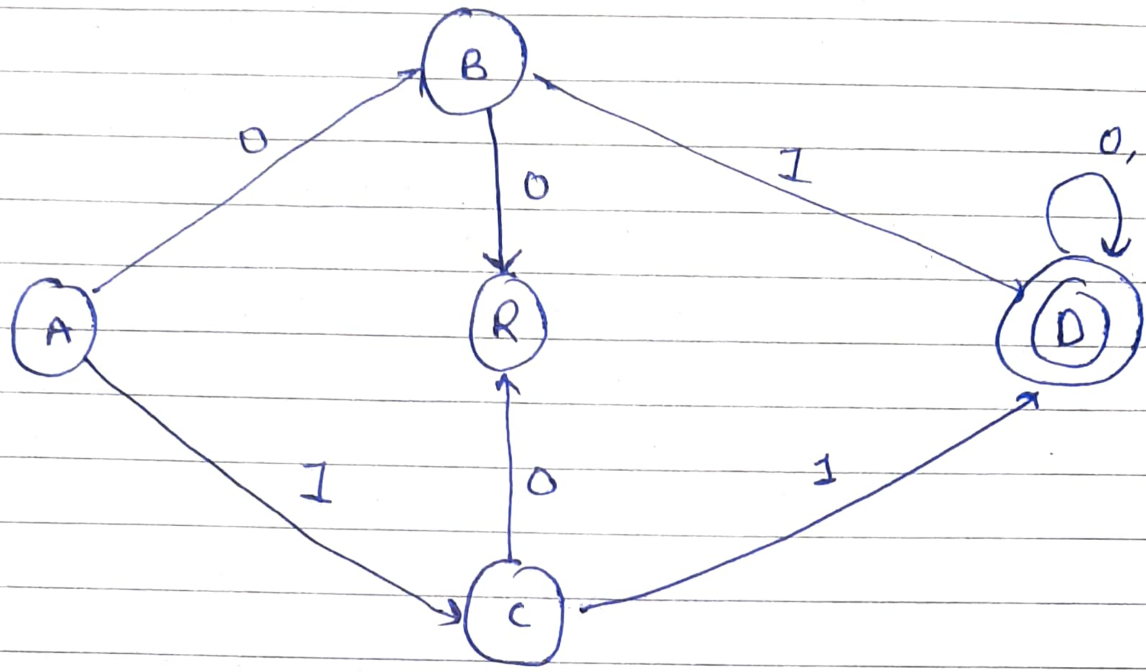
$L_1^* L_2^* = \{\lambda, a, b, ab, abb, aab, \ldots\}$

$(L_1 L_2) = \{ab\}$

$(L_1 L_2)^* = \{ab\}^*$
$= \{\lambda, ab, abab, ababab \ldots\}$

$L_1^* L_2^* \neq (L_1 L_2)^*$

Q-1)
(C)



B, C, A are all Rejecting states

D is accepting states.

d) A regular language is a language that can be expressed with a regular expression or a deterministic or non-deterministic finite automata or state machine.

A language is a set of string which are made up of characters of a specified alphabet or set of symbols.

Regular language are a subset of set of all strings.

e) True

normal induction shows a property P for all natural number by showing P(0) and is P(0), P(n) & then (P(n+1))

while in structural induction is useful when the recursive defination branches into many levels.

f). In a proof of contrapositive we actually use a direct proof to prove the contrapositive of the original implication. In a proof by contradiction we start the supposition that the implication is false, and use this assumption to derive a contradiction this would prove that the implication must be true.

Q-2) Answer ANY Two

A) Basis: let λ be a empty string such that $\lambda \in \Sigma^*$

Induction: for any string x that belongs to Σ^* and 'a' of Σ
xa also belongs to Σ^*

The proof of equality is to be proven for an arbitary fixed x & induction on y. Thus statement to be proven for an arbitary string x & an arbitary string y of Σ^*

$REV(xy) = Rev(y) \cdot Rev(x)$ holds.
The proof mirrors the recursive definition of Σ^*

Basis: $REV(x\lambda) = Rev(x) = Rev(\lambda).Rev(x)$

Induction: We assume for string ~~y~~ of Σ^*
$Rev(xy) = Rev(y) \cdot Rev(x)$ holds (hypothesis).

then for arbitary symbol a of Σ

$Rev(xya) = Rev((xy)a) = a\,Rev(xy)$

But by induction hypothesis

$a \, Rev(xy) = a \, Rev(y) . Rev(x)$

Since $a \, Rev(y) = Rev(ya)$,

$Rev(xya) = Rev(ya) . Rev(x)$

Hence the induction is proved.

Q-2 c) 1) Recursive defination for set of all integer divisible by 7.

→ i) 7 is element of set answer set A $7 \in A$.

ii) for every $x \in A$ & $n \in N$ where N is set of natural numbers $x * n \in A$.

2) Recursive defination for set of all string of form $1^i 0^j$ where $i >= 2j$

lets assume there is a set A contains string of form $1^i 0^j$ $i >= 2j$

i) $\Lambda \in A$

ii) for every $x \in A$ both 1 or 0 and 111 or 0 are in A.

Q-3) Answer the following

a). L_1 = { x belongs to {a, b}* and x does not contain substring ab }

L_1 = { λ, a, b, aa, bb, ba, , aaa, - - - }

Regular expression form of the language

R_1 = { b* a* }

L_2 = { x belongs to {a, b}* and x contains substring aa }.

L_2 = { aa, aaaa, aab, baa - - - }

Regular expression for L_2 language is as follows

$R_2 = (a+b)^* \; aa \; (a+b)^*$

$L_1 \cap L_2$ = ~~R~~ $R = \{ b^i a^{2j}, \; i \geq 0, \; j \geq 1 \}$

= { λ, a, b, aa, bb, ba - - - . }

$\cap$

{ aa, aaa, aaaa, baa, baaa - - - }

= { aa, aaa, aaaa, baaa, baaa - - - - }

Q-3) Answer the following

b). Construct finite automata for expression.
(11 + 110)* 1.

Accepting strings for the above expressions are
= {. 1, 111, 1101, 1111, 111101 --- }

finite automata for the regular expression is as below