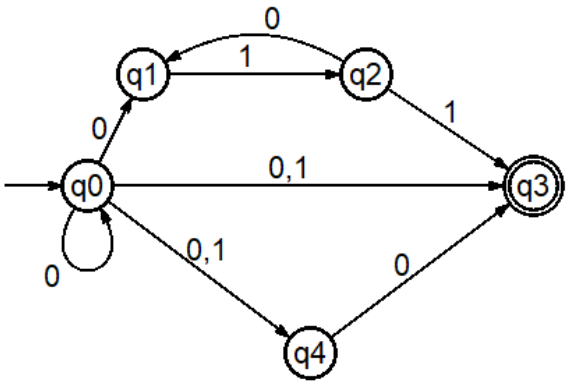
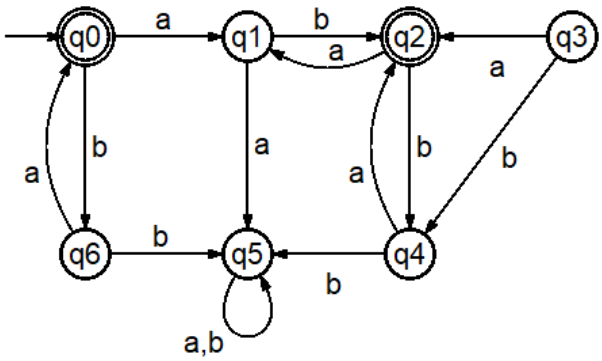
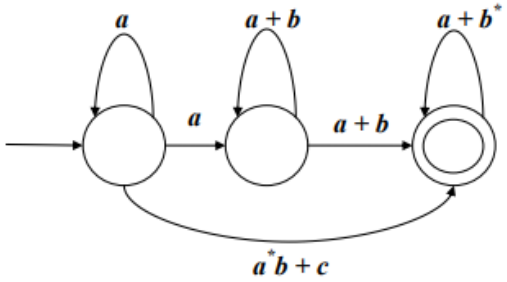
MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

IV SEMESTER B. TECH (COMPUTER SCIENECE AND ENGINEERING)
MAKEUP/GRADE IMPROVEMENT EXAMINATION, Date: 04-08-2021
SUBJECT: FORMAL LANGUAGES AND AUTOMATA THEORY (CSE 2254)
REVISED CREDIT SYSTEM

Time: 2 Hours **MAX. MARKS: 40**

Note: Answer FOUR FULL questions.

1A.	(i) Find the grammar for the following language L = {w: $\|w\| \geq 3$ and the 1st symbol from left is different from the 2nd symbol from the right} on $\Sigma = \{0,1,2\}$. For example the string 12110 is not in L. (ii) Let $\sum = \{a, b\}$, Find a DFA with 3 states for accepting the language $L = \{ w : (2n_a(w) + n_b(w)) \bmod 3 < 2\}$	05
1B.	List 3 differences between DFA & NFA. Convert the NFA given in Fig 1B. to its equivalent DFA.  Fig. 1B	05
2A.	Draw the DFA after Minimizing the number of states in the DFA given in Fig 2A using mark and reduce method.  Fig. 2A	05
2B.	Draw DFA for the regular expression ab(baa)*bb and hence find its left linear grammar	05
3A.	Write λ-NFA for the following regular expressions (i) (0+1+0)*) +(0+1))* (ii) (10+01+00)* +(1+0)(01)*	05

3B.	Obtain regular expression using NFA-to-Regular expression for the given NFA in Fig. 3B.  Fig. 3B	05
4A.	Find the Context Free Grammar for the language L = {$a^{m1}e^{n1}b^{m1}c^{m2}f^{n2}d^{m3}$: m1, m2, m3, n1, n2 > 0 } U { $a^{m1}e^{n1}b^{m2}c^{m2}f^{n2}d^{m3}$: m1, m2, m3, n1, n2>0}. Is this an ambiguous grammar or inherently ambiguous grammar? Justify your answer with an example.	05
4B.	Remove all undesirable productions from the Context Free grammar given below: S → ABab | BabbC | ABD A → aAbE | E | λ B → bBA | b C → c | λ D → aaD | λ E → eeeE | aE F → aA | bbA | ACD	05
5A.	Convert the grammar to (i) CNF : S→ASB | a, A → aAS | λ, B →SbS | A | bb | λ (ii) GNF: S →AB | aB, A→ aab | λ, B→bbA	05
5B.	Construct NPDA with THREE states for the following Language L = {a^nb^m: n ≤ m ≤ 3n } Give ID for the string aabbbbbb	05
6A.	Show that following language is not context-free using pumping lemma. L = {a^nb^m: n and m both are prime}	05
6B.	Construct Turing machine with SIX states for the following language L= {a^nb^{2n} : n ≥ 1} Give ID for the string aabbbb.	05