Subject Name	TAFL	Subject Code	KCS-402
Date of Handout	15-April, 2021	Max Marks	
Date of Submission	20-April, 2021	CO1	

Q1 Find the transitive closure R+ and reflexive transitive closure R* of relation—
R = { (1, 2), (2, 3), (3, 4), (5, 4) }

Q2 Describe the following terms
a) Kleen Closure
b) Star Closure of language (L^*)
c) Positive Closure of language (L^+)

Q3 Define Grammar and Language generated by a grammar.

Q4 Write a CFG which generates string of balanced parenthesis.

Q5 Find the grammars that generates following languages.

a) $L = \{ a^l b^m c^n \mid l + m = n \}$ Assume $\Sigma = \{ a, b, c \}$
b) $L = \{ ww^R : w \in \{a, b\}^+ \}$
c) $L = \{ a^n b^m \mid (n + m) \text{ is even} \}$

d) $L = \{ a^n b^{2n} : n \geq 0 \}$ Assume $\Sigma = \{ a, b \}$
e) $L = \{ a^n b^{n+1} : n \geq 0 \}$ Assume $\Sigma = \{ a, b \}$
f) $L = \{ w : |w| \bmod 3 = 0 \}$ Assume $\Sigma = \{ a \}$
g) $L = \{ w : |w| \bmod 3 = 0 \}$, $w \in \{ a, b \}^*$

h) $L = \{ w : n_a(w) = n_b(w) \}$ Assume $\Sigma = \{ a, b \}$
(where $n_a(w)$ denotes the number of 'a' in string w)

Q6 a) Give a simple description of the language generated by the grammar with productions
$S \rightarrow aA$,
$A \rightarrow bS$,
$S \rightarrow \lambda$,

b) What language does the grammar with these productions generate?
$S \rightarrow Aa$,
$A \rightarrow B$,
$B \rightarrow Aa$,

c) What language does the grammar with these productions generate?
$S \rightarrow SS$,
$S \rightarrow (S)$,
$S \rightarrow \lambda$,