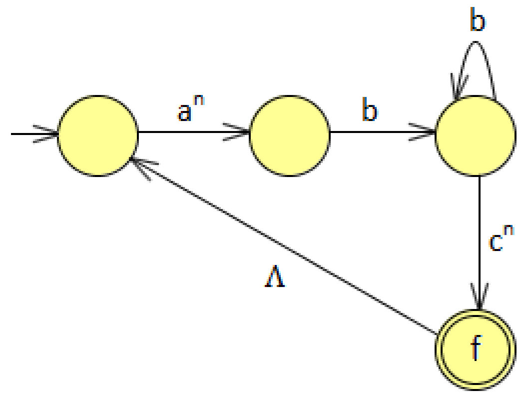
Name Surname: **Signature:** 16-05-2013
Number:

FORMAL LANGUAGES & AUTOMATA
QUIZ-4

a) Design a PDA for the state transition diagram given on the right for $n > 0$.

b) Give execution of the PDA you designed for *aabbccabbbc*.



Note: The accepted state of the PDA must be the same as the final state (f) of the given state transition diagram.

Duration: 30 mins

Solution:

Format of the strings accepted by this PDA: $(a^n b^+ c^n)^+,\ n > 0$

Design of the PDA:

$$M = (S, \Sigma, \Gamma, \Delta, s_0, F)$$

$$S = \{q_0, q_1, q_2, q_3, f\},\ \Sigma = \{a, b, c\},\ \Gamma = \{a, c\},\ s_0 = q_0,\ F = f$$

$$\Delta = \{\ \underbrace{[(q_0, a, \Lambda), (q_1, ac)]}_{a}, \qquad \rightarrow \text{push } c \text{ to be able to check if the stack is empty}$$

$$\underbrace{[(q_1, a, \Lambda), (q_1, a)]}_{a^{n-1}}, \underbrace{[(q_1, b, \Lambda), (q_2, \Lambda)]}_{b},$$

$$\underbrace{[(q_2, b, \Lambda), (q_2, \Lambda)]}_{b^*}, \underbrace{[(q_2, c, a), (q_3, \Lambda)]}_{c},$$

$$\underbrace{[(q_3, c, a), (q_3, \Lambda)]}_{c^{n-1}}, \underbrace{[(q_3, a, c), (q_1, ac)]}_{(a^n b^+ c^n)^+}, \underbrace{[(q_3, \Lambda, c), (f, \Lambda)]}_{\text{accept the word}}\ \}$$

Execution for the given word:

State	Tape	Stack	Transition Rule
q_0	*aabbccabbbc*	Λ	$[(q_0, a, \Lambda), (q_1, ac)]$
q_1	*abbccabbbc*	*ac*	$[(q_1, a, \Lambda), (q_1, a)]$
q_1	*bbccabbbc*	*aac*	$[(q_1, b, \Lambda), (q_2, \Lambda)]$
q_2	*bccabbbc*	*aac*	$[(q_2, b, \Lambda), (q_2, \Lambda)]$
q_2	*ccabbbc*	*aac*	$[(q_2, c, a), (q_3, \Lambda)]$
q_3	*cabbbc*	*ac*	$[(q_3, c, a), (q_3, \Lambda)]$
q_3	*abbbc*	*c*	$[(q_3, a, c), (q_1, ac)]$
q_1	*bbbc*	*ac*	$[(q_1, b, \Lambda), (q_2, \Lambda)]$
q_2	*bbc*	*ac*	$[(q_2, b, \Lambda), (q_2, \Lambda)]$
q_2	*bc*	*ac*	$[(q_2, b, \Lambda), (q_2, \Lambda)]$
q_2	*c*	*ac*	$[(q_2, c, a), (q_3, \Lambda)]$
q_3	Λ	*c*	$[(q_3, \Lambda, c), (f, \Lambda)]$
f	Λ	Λ	