1. AUTOMATE FINITE

- 1) Să se reprezinte automatul finit în formă tabelară și grafică.
- 2) Pentru cinci cuvinte (3 corecte și 2 incorecte) să se demonstreze printr-un calcul de configurații acceptarea sau neacceptarea cuvintelor.
- 3) Să se construiască gramatica regulată echivalentă.
- 4) Pentru două cuvinte acceptate de automatul finit, să se demonstreze printr-un calcul de derivări generarea acestor cuvinte și de gramatica regulată.
- 5) Să se construiască arborele de derivare pentru fiecare din cuvinte.
- 6) Construiți automatul finit determinist echivalent.
- 7) Reprezentați automatul finit determinist în formă grafică.
- 8) Pentru două cuvinte acceptate de automatul finit nedeterminist demonstrați, printr-un calcul de configurații, acceptarea sau neacceptarea cuvintelor și de automatul finit determinist.
- 9) Să se construiască reprezentarea uvw pentru trei cuvinte recunoscute de automatul finit determinist aplicând lema de pompare.
 - 1. AF=(Q, Σ , δ ,q₀,F), Q={q₀,q₁,q₂,q₃}, Σ ={a,b,c}, F={q₃}, δ (q₀,a)={q₀,q₁}, δ (q₂,b)={q₂}, δ (q₃,c)={q₃}, δ (q₁,b)={q₁,q₂}, δ (q₂,c)={q₂,q₃}
 - 2. AF=(Q, Σ , δ ,q₀,F), Q={q₀,q₁,q₂,q₃}, Σ ={a,b}, F={q₃}, δ (q₀,a)={q₀,q₁}, δ (q₀,b)={q₀,q₂}, δ (q₁,a)={q₃}, δ (q₂,b)={ q₁, q₃}
 - 3. AF=(Q, Σ , δ ,q₀,F), Q={q₀,q₁,q₂,q₃}, Σ ={7,8,9}, F={q₃}, δ (q₀,7)={q₀,q₁}, δ (q₁,8)={q₁,q₂}, δ (q₁,7)={q₁}, δ (q₂,9)={q₃}, δ (q₃,9)={q₃}
 - 4. AF=(Q, Σ , δ ,q₀,F), Q={q₀,q₁,q₂}, Σ ={1,2}, F={q₂}, δ (q₀,1)={q₀,q₁}, δ (q₀,2)={q₀}, δ (q₁,2)={q₂}, δ (q₂,2)={q₂, q₁}

5. AF=(Q,
$$\Sigma$$
, δ ,q₀,F), Q={q₀,q₁,q₂,q₃}, Σ ={0,1}, F={q₃}, δ (q₀,1)={q₀}
$$\delta$$
(q₃,1)={q₃}, δ (q₁,1)={q₀, q₃}, δ (q₃,0)={q₃}, δ (q₀,0)={q₁},
$$\delta$$
(q₂,0)={q₃}, δ (q₁,0)={q₂}, δ (q₂,1)={q₀}

6. AF=(Q,
$$\Sigma$$
, δ ,q₀,F), Q={q₀,q₁,q₂,q₃}, Σ ={a,b,c}, F={q₃},
$$\delta$$
(q₀,a)={q₁}, δ (q₀,b)={q₁, q₂}, δ (q₁,b)={q₀}, δ (q₁,a)={q₂},
$$\delta$$
(q₂,a)={q₁}, δ (q₂,c)={q₃, q₀}

7. AF=(Q,
$$\Sigma$$
, δ ,q₀,F), Q={q₀,q₁,q₂,q₃}, Σ ={1,2,3}, F={q₃},
$$\delta$$
(q₀,1)={q₁}, δ (q₀,2)={q₁, q₀}, δ (q₁,2)={q₀}, δ (q₁,1)={q₂},
$$\delta$$
(q₂,1)={q₁}, δ (q₂,3)={q₃}, δ (q₃,1)={q₁, q₂}, δ (q₃,2)={q₂}

8. AF=(Q,
$$\Sigma$$
, δ ,q₀,F), Q={q₀,q₁,q₂,q₃}, Σ ={a,b,c}, F={q₃},
$$\delta$$
(q₀,a)={q₁}, δ (q₂,b)={q₀,q₂}, δ (q₃,c)={q₃}, δ (q₁,b)={q₁,q₃},
$$\delta$$
(q₂,c)={q₂}, δ (q₁,a)={q₂}, δ (q₃,b)={q₁},

9. AF=(Q,
$$\Sigma$$
, δ ,q₀,F), Q={q₀,q₁,q₂,q₃}, Σ ={a,b}, F={q₃},
$$\delta$$
(q₀,a)={q₀,q₁}, δ (q₀,b)={q₂}, δ (q₁,a)={ q₁, q₃}, δ (q₂,b)={q₃}

10. AF=(Q,
$$\Sigma$$
, δ ,q₀,F), Q={q₀,q₁,q₂,q₃}, Σ ={1,8,4}, F={q₃},
$$\delta$$
(q₀,1)={q₁},

$$\delta(q_1,8)=\{q_1,q_2\}, \delta(q_1,1)=\{q_1\}, \delta(q_2,4)=\{q_3\}, \delta(q_3,4)=\{q_1,q_3\}$$

11. AF=(Q,
$$\Sigma$$
, δ ,q₀,F), Q={q₀,q₁,q₂}, Σ ={1,2,3}, F={q₂},
$$\delta$$
(q₀,1)={q₀,q₂},

$$\delta(q_0,2) = \{q_0, q_1\}, \delta(q_1,2) = \{q_2\}, \delta(q_2,3) = \{q_2, q_1\}$$

12. AF=(Q,
$$\Sigma$$
, δ ,q0,F), Q={q₀,q₁,q₂,q₃}, Σ ={0,1,2}, F={q₃},
$$\delta(q_0,1)$$
={q₁}, $\delta(q_3,2)$ ={q₃}, $\delta(q_1,1)$ ={q₀, q₃}, $\delta(q_3,1)$ ={q₃},
$$\delta(q_2,0)$$
={q₃}, $\delta(q_1,0)$ ={q₂}, $\delta(q_2,2)$ ={q₀, q₃}

13. AF=
$$(Q, \Sigma, \delta, q_0, F)$$
, Q= $\{q_0, q_1, q_2, q_3\}$, $\Sigma = \{a, b\}$, F= $\{q_3\}$, $\delta(q_0, a) = \{q_1\}$, $\delta(q_0, b) = \{q_1\}$, $\delta(q_1, a) = \{q_1\}$, $\delta(q_1, b) = \{q_2\}$, $\delta(q_2, b) = \{q_1\}$, $\delta(q_2, a) = \{q_3\}$, $q_0\}$

14. AF=(Q,
$$\Sigma$$
, δ ,q₀,F), Q={q₀,q₁,q₂,q₃}, Σ ={9,1,3}, F={q₃},
$$\delta(q_0,3)$$
={q₁},
$$\delta(q_0,9)$$
={q₁, q₀}, $\delta(q_1,3)$ ={q₀}, $\delta(q_1,1)$ ={q₂}, $\delta(q_2,9)$ ={q₁},
$$\delta(q_2,3)$$
={q₃}, $\delta(q_3,9)$ ={q₁}

- 15. AF= (Q,Σ,δ,q_0,F) , Q= $\{q_0,q_1,q_2,q_3\}$, Σ = $\{b,c\}$, F= $\{q_3\}$, $\delta(q_0,b)$ = $\{q_1\}$, $\delta(q_1,b)$ = $\{q_0\}$, $\delta(q_1,c)$ = $\{q_2\}$, $\delta(q_2,c)$ = $\{q_3,q_0,q_1\}$, $\delta(q_3,b)$ = $\{q_1\}$
- 16. AF=(Q, Σ , δ ,q₀,F), Q={q₀,q₁,q₂,q₃}, Σ ={0,1,2,3}, F={q₃}, δ (q₀,1)={q₁}, δ (q₀,2)={q₁, q₀}, δ (q₁,2)={q₁}, δ (q₁,0)={q₂}, δ (q₂,1)={q₁}, δ (q₂,3)={q₃}, δ (q₃,0)={q₂, q₃}
- 17. AF=(Q, Σ , δ ,q₀,F), Q={q₀,q₁,q₂,q₃}, Σ ={a,b,c,d}, F={q₃}, δ (q₀,a)={q₁}, δ (q₂,b)={q₂}, δ (q₃,c)={q₃}, δ (q₁,d)={q₃,q₂}, δ (q₂,c)={q₁,q₃}
- 18. AF=(Q, Σ , δ ,q₀,F), Q={q₀,q₁,q₂,q₃}, Σ ={a,b,c}, F={q₃}, δ (q₀,a)={q₀,q₁}, δ (q₀,c)={q₀,q₂}, δ (q₁,a)={ q₁, q₃}, δ (q₂,b)={q₃}
- 19. AF=(Q, Σ , δ ,q₀,F), Q={q₀,q₁,q₂,q₃}, Σ ={1,2,9}, F={q₃}, δ (q₀,1)={q₀,q₁}, δ (q₁,2)={q₁,q₂,q₃}, δ (q₁,1)={q₁,q₃}, δ (q₂,2)={q₃}, δ (q₃,9)={q₁,q₃}
- $$\begin{split} 20. \ AF &= (Q, \Sigma, \delta, q_0, F), \ Q = \{q_0, q_1, q_2, q_3\}, \ \Sigma = \{a, b, c, d\}, \ F = \{q_3\}, \\ \delta(q_0, d) &= \{q_1, q_2\}, \ \delta(q_2, b) = \{q_0, q_2\}, \ \delta(q_3, c) = \{q_3\}, \ \delta(q_1, b) = \{q_1, q_3\}, \\ \delta(q_2, c) &= \{q_2\}, \ \delta(q_1, a) = \{q_2\}, \ \delta(q_3, b) = \{q_1\} \end{split}$$
- 21. AF=(Q, Σ , δ ,q₀,F), Q={q₀,q₁,q₂,q₃}, Σ ={1,8,4}, F={q₃}, δ (q₀,1)={q₀,q₁}, δ (q₁,8)={q₁,q₂}, δ (q₂,4)={q₃}, δ (q₃,1)={q₃,q₁}
- 22. AF= $(Q, \Sigma, \delta, q_0, F)$, Q= $\{q_0, q_1, q_2\}$, Σ = $\{a, b\}$, F= $\{q_2\}$, $\delta(q_0, b)$ = $\{q_0, q_1\}$, $\delta(q_0, a)$ = $\{q_0\}$, $\delta(q_1, a)$ = $\{q_2\}$, $\delta(q_2, b)$ = $\{q_2, q_1\}$

23.
$$AF=(Q,\Sigma,\delta,q_0,F), Q=\{q_0,q_1,q_2,q_3\}, \Sigma=\{0,1\}, F=\{q_3\}, \delta(q_0,1)=\{q_0\}, \delta(q_3,1)=\{q_3\}, \delta(q_1,1)=\{q_0,q_2,q_3\}, \delta(q_3,0)=\{q_3\}, \delta(q_0,0)=\{q_1\}, \delta(q_2,0)=\{q_3\}, \delta(q_2,1)=\{q_0\}$$
24. $AF=(Q,\Sigma,\delta,q_0,F), Q=\{q_0,q_1,q_2,q_3\}, \Sigma=\{a,b,c\}, F=\{q_3\}, \delta(q_0,a)=\{q_1\}, \delta(q_0,a)=\{q_1\}, \delta(q_0,a)=\{q_1\}, \delta(q_1,b)=\{q_0,q_2\}, \delta(q_2,a)=\{q_1\}, \delta(q_2,c)=\{q_3,q_0\}, \delta(q_3,a)=\{q_2\}$
25. $AF=(Q,\Sigma,\delta,q_0,F), Q=\{q_0,q_1,q_2,q_3\}, \Sigma=\{a,d,c\}, F=\{q_3\}, \delta(q_0,a)=\{q_1\}, \delta(q_2,c)=\{q_3,q_0\}, \delta(q_1,a)=\{q_2\}, \delta(q_2,a)=\{q_1\}, \delta(q_2,c)=\{q_3,q_0\}, \delta(q_3,a)=\{q_2\}$
26. $AF=(Q,\Sigma,\delta,q_0,F), Q=\{q_0,q_1,q_2,q_3\}, \Sigma=\{a,b,c\}, F=\{q_3\}, \delta(q_2,c)=\{q_2,q_3\}, \delta(q_2,c)=\{q_2,q_3\}, \delta(q_3,c)=\{q_3\}, \delta(q_1,b)=\{q_1,q_2\}, \delta(q_2,c)=\{q_2,q_3\}, \delta(q_2,c)=\{q_2,q_3\}, \Sigma=\{a,b\}, F=\{q_3\}, \delta(q_0,a)=\{q_0,q_1\}, \delta(q_2,b)=\{q_1,q_2,q_3\}, \Sigma=\{a,b\}, F=\{q_3\}, \delta(q_0,a)=\{q_0,q_1\}, \delta(q_0,a)=\{q_0,q_1\}, \delta(q_1,a)=\{q_1,q_3\}, \delta(q_2,b)=\{q_3\}, \delta(q_0,a)=\{q_0,q_1\}, \delta(q_0,a)=\{q_0,q_1\}, \delta(q_1,a)=\{q_1,q_2,q_3\}, \Sigma=\{a,b\}, F=\{q_3\}, \delta(q_0,a)=\{q_0,q_1\}, \delta(q_0,a)=\{q_0,q_1\}, \delta(q_1,a)=\{q_1,q_2,q_3\}, \Sigma=\{a,b\}, F=\{q_3\}, \delta(q_0,a)=\{q_0,q_1\}, \delta(q_0,a)=\{q_0,q_1\}, \delta(q_1,a)=\{q_1,q_2,q_3\}, \Sigma=\{a,b\}, F=\{q_3\}, \delta(q_0,a)=\{q_0,q_1\}, \delta(q_0,a)=\{q_0,q_1\}, \delta(q_1,a)=\{q_1,q_2\}, \delta(q_1,a)=\{q_1,q_3\}, \delta(q_2,b)=\{q_1,q_3\}, \delta(q_0,a)=\{q_0,q_1\}, \delta(q_0,a)=\{q_0,q_1\}, \delta(q_1,a)=\{q_1,q_2\}, \delta(q_1,a)=\{q_1,q_3\}, \delta(q_2,b)=\{q_3\}, \delta(q_2,a)=\{q_1\}, \delta(q_2,a)=\{q_0,q_1,q_2,q_3\}, \Sigma=\{a,b\}, F=\{q_3\}, \delta(q_0,a)=\{q_0,q_1\}, \delta(q_0,a)=\{q_0,q_1\}, \delta(q_1,a)=\{q_1,q_2\}, \delta(q_1,a)=\{q_1,q_3\}, \delta(q_2,b)=\{q_1,q_3\}, \delta(q_2,a)=\{q_1,q_2\}, \delta(q_1,a)=\{q_1,q_2\}, \delta(q_1,a)=\{q_1,q_2\}, \delta(q_1,a)=\{q_1,q_2\}, \delta(q_1,a)=\{q_1,q_2\}, \delta(q_1,a)=\{q_1,q_2\}, \delta(q_1,a)=\{q_1,q_2\}, \delta(q_1,a)=\{q_1,q_2\}, \delta(q_1,a)=\{q_0,q_1\}, \delta(q_2,a)=\{q_0,q_1,q_2\}, \delta(q_1,a)=\{q_0,q_1\}, \delta(q_1,a)=\{q_0,q_1\}, \delta(q_1,a)=\{q_0,q_1,q_2\}, \delta(q_1,a)=\{q_0,q_1\}, \delta(q_1,a)=\{q_0,q_1,q_2\}, \delta(q_1,a)=\{q_0,q_1\}, \delta(q_1,a)=\{q_0,q_1,q_2\}, \delta(q_1,a)=\{q_0,q_1\}, \delta(q_1,a)=\{q_0,q_1,q_2\}, \delta(q_1,a)=\{q_0,q_1\}, \delta(q_1,a)=\{q_0,q_1,q_2\}, \delta(q_1,a)=\{q_0,q_1\}, \delta(q_1,a)=\{q_0,q_1,q_2\}, \delta(q_1,a)=\{q_0,q_1\}, \delta(q_1,a)=\{q_0,q_1\}, \delta(q_1,a)=\{q_0,q_1,q_2\}, \delta(q_1,a)=\{q_1,q_1\},$

31. AF=
$$(Q,\Sigma,\delta,q_0,F)$$
, Q= $\{q_0,q_1,q_2,q_3\}$, Σ = $\{0,1\}$, F= $\{q_3\}$, $\delta(q_0,1)$ = $\{q_0\}$
 $\delta(q_3,1)$ = $\{q_3\}$, $\delta(q_1,1)$ = $\{q_0,q_3\}$, $\delta(q_3,0)$ = $\{q_3\}$, $\delta(q_0,0)$ = $\{q_1\}$, $\delta(q_2,0)$ = $\{q_3\}$, $\delta(q_1,0)$ = $\{q_2\}$

$$\begin{split} 32. \ AF &= (Q, \Sigma, \delta, q_0, F), \ Q = \{q_0, q_1, q_2, q_3\}, \ \Sigma = \{1, 2, 3\}, \ F = \{q_3\}, \\ \delta(q_0, 1) &= \{q_1\}, \\ \delta(q_0, 2) &= \{q_1, q_0\}, \ \delta(q_1, 1) = \{q_2\}, \ \delta(q_2, 1) = \{q_1\}, \ \delta(q_2, 3) = \{q_3\}, \\ \delta(q_3, 1) &= \{q_1, q_2\}, \ \delta(q_3, 2) = \{q_2\} \end{split}$$

33. AF=(Q,
$$\Sigma$$
, δ ,q₀,F), Q={q₀,q₁,q₂,q₃}, Σ ={1,8,4}, F={q₃},
$$\delta$$
(q₀,1)={q₁},
$$\delta$$
(q₁,8)={q₁,q₂}, δ (q₁,1)={q₁}, δ (q₂,4)={q₃}, δ (q₃,4)={ q₁,q₃}

34. AF=
$$(Q, \Sigma, \delta, q_0, F)$$
, Q= $\{q_0, q_1, q_2\}$, $\Sigma = \{1, 2, 3\}$, F= $\{q_2\}$, $\delta(q_0, 1) = \{q_0, q_2\}$, $\delta(q_0, 2) = \{q_0, q_1\}$, $\delta(q_1, 2) = \{q_2\}$, $\delta(q_2, 3) = \{q_2, q_1\}$

- 35. AF=(Q, Σ , δ ,q₀,F), Q={q₀,q₁,q₂,q₃}, Σ ={0,1,2}, F={q₃}, δ (q₀,1)={q₀, q₁}, δ (q₃,2)={q₃}, δ (q₁,1)={q₀, q₃}, δ (q₃,1)={q₃}, δ (q₂,0)={q₃}, δ (q₁,0)={q₂}, δ (q₂,2)={q₀, q₃}
- 36. AF=(Q, Σ , δ ,q₀,F), Q={q₀,q₁,q₂,q₃}, Σ ={a,b}, F={q₃}, δ (q₀,a)={q₁}, δ (q₀,b)={q₁}, δ (q₁,a)={q₀, q₁}, δ (q₁,b)={q₂}, δ (q₂,b)={q₁}, δ (q₂,a)={q₃, q₀}