

# **BAZE PODATAKA I**



**Pripremila: Lena Joković**

БП К2-22

①.  $\Pi F = \{AE \rightarrow D, CG \rightarrow DEF, F \rightarrow AG, CDG \rightarrow F, CF \rightarrow DG\}$

$R(A, B, C, D, E, F, G), F = \{AE \rightarrow D, \dots\}$

$R_1(A, E, D), F = \{AE \rightarrow D\}$

$R'(A, B, C, E, F, G), F = \{CG \rightarrow EF, \dots\}$

$R'_1(C, G, E, F), F = \{CG \rightarrow EF, F \rightarrow G\}$

$R_2(F, G), F = \{F \rightarrow G\}$

$R_3(C, E, F), F = \{CF \rightarrow E\}$

$R'_2(A, B, C, G), F = \{CG \rightarrow A, \dots\}$

$R_4(A, C, G), F = \{CG \rightarrow A\}$

$R_5(B, C, G), F = \{\}$

а)  $AE \rightarrow D$  - није изтудљена

$CG \rightarrow DEF$  - изтудљена

$F \rightarrow G$  - није изтудљена,  $F \rightarrow A$  - изтудљена

$CDG \rightarrow F$  - изтудљена

$CF \rightarrow DG$  - није изтудљена

K2-21 CM

60

①  $R(A, B, C, D, E, F, G)$  $F = \{ABC \rightarrow \cancel{E}, CD \rightarrow G, G \rightarrow A, AE \rightarrow B\}$ a)  $C: F$ ii)  $C, D$ 

iii)

iv)  $A, B, E, G$ 

$$(CDF)^+ = CDFGA$$

$$(CDFA)^+ = CDFAAG$$

$$(CDFB)^+ = CDFBGAE \Rightarrow KK$$

$$(CDFE)^+ = CDFEGAB \Rightarrow KK$$

$$(CDFG)^+ = CDFGA$$

$$(CDFAG)^+ = CDFAG$$

$$\Rightarrow KK = \{CDFB, CDFE\}$$

| 5)   | $ABC \rightarrow CE$ | $CD \rightarrow G$ | $G \rightarrow A$ | $AE \rightarrow B$ |
|------|----------------------|--------------------|-------------------|--------------------|
| BCNF | X                    | X                  | X                 | X                  |
| 3NF  | ✓                    | X                  | X                 | ✓                  |
| 2NF  | ✓                    | X                  | ✓                 | ✓                  |

БП К2-21 ЧМ

①  $R(A, B, C, D, E, F, G)$

$F = \{ABC \rightarrow E, CD \rightarrow G, G \rightarrow A, AE \rightarrow B\}$

б)  $F = \{ABC \rightarrow E, CD \rightarrow G, G \rightarrow A, AE \rightarrow B\}$

$ABC \rightarrow E : \neg A (BC)^+ = BC, \neg B (AC)^+ = AC, \neg C (AB)^+ = AB$

$CD \rightarrow G : \neg C (D)^+ = D, \neg D (C)^+ = C$

$AE \rightarrow B : \neg A (E)^+ = E, \neg E (A)^+ = A$

$ABC \rightarrow E : \neg E (ABC)^+ = ABC$

$CD \rightarrow G : \neg G (CD)^+ = CD$

$G \rightarrow A : \neg A (G)^+ = G$

$AE \rightarrow B : \neg B (AE)^+ = AE$

$\Rightarrow F_c = \{ABC \rightarrow E, CD \rightarrow G, G \rightarrow A, AE \rightarrow B\}$

$R_1(A, B, C, E)$ ,  $R_2(C, D, G)$ ,  $R_3(G, A)$ ,  $R_4(C, D, E, B)$

② 1)  $R(A, B, C, D, E, F, G)$ ,  $F = \{ \underline{AE \rightarrow B} \}$ , ...

$\rightarrow \underline{R_1(A, E, B)}$ ,  $F = \{ AE \rightarrow B \}$

$\rightarrow \underline{R'(A, C, D, E, F, G)}$ ,  $F = \{ \underline{G \rightarrow A} \}$ , ...

$\rightarrow \underline{R_2(A, G)}$ ,  $F = \{ G \rightarrow A \}$

$\rightarrow \underline{R''(C, D, E, F, G)}$ ,  $F = \{ \underline{CD \rightarrow G} \}$ , ...

$\rightarrow \underline{R_3(C, D, G)}$ ,  $F = \{ CD \rightarrow G \}$

$\rightarrow \underline{R_4(C, D, E, F)}$ ,  $F = \{ \}$

g)  $ABC \rightarrow E$  - изтуджена

$CD \rightarrow G$  - није изтуджена

$G \rightarrow A$  - није изтуджена

$AE \rightarrow B$  - није изтуджена

1.  $R(A, B, C, D, E, F, G)$

$$F = \{AG \rightarrow B, CD \rightarrow F, BC \rightarrow \cancel{F}, FG \rightarrow D, AC \rightarrow \cancel{F}D\}$$

a) i: E

ii: A, C, G

iii:

iv: B, D, F

$$(EACG)^+ = EACGBFD \Rightarrow KK$$

$$\Rightarrow KK = \{EACG\}$$

| 5)   | $AG \rightarrow B$ | $CD \rightarrow F$ | $BC \rightarrow F$ | $FG \rightarrow D$ | $AC \rightarrow FD$ |
|------|--------------------|--------------------|--------------------|--------------------|---------------------|
| BCNF | X                  | X                  | X                  | X                  | X                   |
| 3NF  | X                  | X                  | X                  | X                  | X                   |
| 2NF  | X                  | ✓                  | ✓                  | ✓                  | X                   |

b)  $F = \{AG \rightarrow B, CD \rightarrow F, BC \rightarrow F, FG \rightarrow D, AC \rightarrow \cancel{D}\}$

$$AG \rightarrow B : ?A : (G)^+ = G, ?G : (A)^+ = A$$

...

$$AG \rightarrow B : ?B : (AG)^+ = AG$$

...

$$AC \rightarrow FD : ?F : (AC)^+ = ACDF \checkmark, ?D : (AC)^+ = AC$$

$$\Rightarrow F_c = \{AG \rightarrow B, CD \rightarrow F, BC \rightarrow F, FG \rightarrow D, AC \rightarrow D\}$$

$$\Rightarrow R_1(A, G, B), R_2(C, D, F), R_3(B, C, F), R_4(F, G, D),$$

$$R_5(A, C, D), R_6(E, A, C, G)$$

1. ii)  $R(A, B, C, D, E, F, G), F = \{ \underline{AG \rightarrow B}, \dots \}$

$\rightarrow \underline{R_1(A, G, B)}, F = \{ AG \rightarrow B \}$

$\rightarrow R'(A, C, D, E, F, G), F = \{ \underline{CD \rightarrow F}, \dots \}$

$\rightarrow \underline{R_2(C, D, F)}, F = \{ CD \rightarrow F \}$

$\rightarrow R''(A, C, D, E, G), F = \{ \underline{AC \rightarrow D}, \dots \}$

$\rightarrow \underline{R_3(A, C, D)}, F = \{ AC \rightarrow D \}$

$\rightarrow \underline{R_4(A, C, E, G)}, F = \{ \}$

g)  $AG \rightarrow B$  nije izvedena

$CD \rightarrow F$  nije izvedena

$BC \rightarrow F$  izvedena

$FG \rightarrow D$  izvedena

$AC \rightarrow FD$  nije izvedena

57 K2-19

②  $R(A, B, C, D, E, F, G, H)$

$F = \{CE \rightarrow GA, G \rightarrow FH, HD \rightarrow B, F \rightarrow CGA\}$

a) i:

ii: D, E

iii: A, B

iv: C, F, G, H

$$(DE)^+ = DE$$

$$(DEC)^+ = DEC GA FHB \Rightarrow KK$$

$$(DEF)^+ = DEF CG AHB \Rightarrow KK$$

$$(DEG)^+ = DEG FHB CA \Rightarrow KK$$

$$(DEH)^+ = DEHB$$

$$\Rightarrow KK = \{DEC, DEF, DEG\}$$

| $\delta_1$ | $CE \rightarrow GA$ | $G \rightarrow FH$ | $HD \rightarrow B$ | $F \rightarrow CGA$ |
|------------|---------------------|--------------------|--------------------|---------------------|
| BCNF       | x                   | x                  | x                  | x                   |
| 3NF        | x                   | x                  | x                  | x                   |
| 2NF        | x                   | x                  | ✓                  | x                   |

g)  $CE \rightarrow GA$  - изтудљена

$G \rightarrow FH$  - није изтудљена,  $HD \rightarrow B$  - није изтудљена

$F \rightarrow CGA$  - није изтудљена

$$(2) b) F = \{ CE \rightarrow G, G \rightarrow FH, HD \rightarrow B, F \rightarrow CGA \}$$

$$CE \rightarrow GA : ?C (E)^+ = E, ?E (C)^+ = C$$

$$HD \rightarrow B : ?H (D)^+ = D, ?D (H)^+ = H$$

$$CE \rightarrow GA : ?G (CE)^+ = CEA, ?A (CE)^+ = CEGFHA$$

$$G \rightarrow FH : ?F (G)^+ = GH, ?H (G)^+ = GFCGA$$

$$HD \rightarrow B : ?B (HD)^+ = HD$$

$$F \rightarrow CGA : ?C (F)^+ = FG AH, ?G (F)^+ = FCA, ?A (F)^+ = FCGH$$

$$\Rightarrow F_c = \{ CE \rightarrow G, G \rightarrow FH, HD \rightarrow B, F \rightarrow CGA \}$$

$$R_1(C, E, G), R_2(G, F, H), R_3(H, D, B), R_4(F, C, G, A),$$

$$R_5(D, E, C)$$

$$1) R(A, B, C, D, E, F, G, H), F = \{ \underline{F \rightarrow CGA} \}$$

$$\rightarrow \underline{R_1(F, C, G, A)}, F = \{ \underline{F \rightarrow CGA}, G \rightarrow FCA \}$$

$$\rightarrow \underline{R'(B, D, E, F, H)}, F = \{ \underline{HD \rightarrow B} \}$$

$$\rightarrow \underline{R_2(H, D, B)}, F = \{ \underline{HD \rightarrow B} \}$$

$$\rightarrow \underline{R''(D, E, F, H)}, F = \{ \underline{F \rightarrow H} \}$$

$$\rightarrow \underline{R_3(F, H)}, F = \{ \underline{F \rightarrow H} \}$$

$$\rightarrow \underline{R_4(D, E, F)}, F = \{ \}$$

БП К2-18

②  $R(A, B, C, D, E, F, G, H)$

$$F = \{ AFG \rightarrow H, E \rightarrow DF, FG \rightarrow A, C \rightarrow AF, CD \rightarrow EFG \}$$

i)  $C: B$

ii)  $C$

iii)  $H$

iv)  $A, D, E, F, G$

$$(BC)^+ = BC A F$$

$$(BCA)^+ = BC A F$$

$$(BCD)^+ = BC D A F E G H \Rightarrow \text{KK}$$

$$(BCE)^+ = BC E A F D G H \Rightarrow \text{KK}$$

$$(BCF)^+ = BC F A$$

$$(BCG)^+ = BC G A F H$$

$$(BCAF)^+ = BC A F$$

$$(BCAG)^+ = BC A G F H$$

$$(BCFG)^+ = BC F G A H$$

$$(BCAFG)^+ = BC A F G H$$

$$\Rightarrow \text{KK} = \{ BCD, BCE \}$$

2.)

|      | $AFG \rightarrow H$ | $E \rightarrow PF$ | $FG \rightarrow AG$ | $C \rightarrow AF$ | $CD \rightarrow EFG$ |
|------|---------------------|--------------------|---------------------|--------------------|----------------------|
| BCNF | x                   | x                  | x                   | x                  | x                    |
| 3NF  | x                   | x                  | x                   | x                  | x                    |
| 2NF  | ✓                   | x                  | ✓                   | x                  | x                    |

b)  $F = \{ \cancel{AFG \rightarrow H}, E \rightarrow DF, FG \rightarrow A, C \rightarrow AF, CD \rightarrow E \cancel{FG} \}$

$AFG \rightarrow H, \text{ ? } A (FG)^+ = FGA, \text{ ? } F, (G)^+ = G, \text{ ? } G, (F)^+ = F$

$FG \rightarrow A, \text{ ? } F (G)^+ = G, \text{ ? } G (F)^+ = F$

$CD \rightarrow EFG, \text{ ? } C (D)^+ = D, \text{ ? } D (C)^+ = CAF$

$FG \rightarrow H, \text{ ? } H (FG)^+ = FGA$

$E \rightarrow DF, \text{ ? } D (E)^+ = EF, \text{ ? } F (E)^+ = ED$

$FG \rightarrow A, \text{ ? } A (FG)^+ = FGA$

$C \rightarrow AF, \text{ ? } A (C)^+ = CAF, \text{ ? } F (C)^+ = CA$

$CD \rightarrow EFG, \text{ ? } E (CD)^+ = CDEFGHA, \text{ ? } F (CD)^+ = CDEGAF$

$\text{ ? } G (CD)^+ = CDEAF$

$\Rightarrow F_c = \{ FG \rightarrow AH, E \rightarrow DF, C \rightarrow AF, CD \rightarrow EG \}$

$R_1(F, G, A, H), R_2(E, D, F), R_3(C, A, F),$

$R_4(C, D, E, G), R_5(B, C, D)$

FD K2-18

② T)  $F = \{ AFG \rightarrow H, E \rightarrow DF, FG \rightarrow A, C \rightarrow AF, CD \rightarrow EFG \}$

$R(A, B, C, D, E, F, G, H), F = \{ \underline{CD \rightarrow EFG} \}$

$\rightarrow R'(C, D, E, F, G), F = \{ \underline{C \rightarrow F} \}$

$\rightarrow \underline{R_1(C, F)}, F = \{ C \rightarrow F \}$

$\rightarrow R''(C, D, E, G), F = \{ \underline{E \rightarrow D} \}$

$\rightarrow \underline{R_2(E, D)}, F = \{ E \rightarrow D \}$

$\rightarrow \underline{R_3(C, E, G)}, F = \{ \}$

$\rightarrow R'''(A, B, C, D, H), F = \{ \underline{C \rightarrow A} \}$

$\rightarrow \underline{R_4(C, A)}, F = \{ C \rightarrow A \}$

$\rightarrow R''''(B, C, D, H), F = \{ \underline{CD \rightarrow H} \}$

$\rightarrow \underline{R_5(C, D, H)}, F = \{ CD \rightarrow H \}$

$\rightarrow \underline{R_6(B, C, D)}, F = \{ \}$

g)  $AFG \rightarrow H$  - изтуджена

$E \rightarrow D$  - није изтуджена,  $E \rightarrow F$  - изтуджена

$FG \rightarrow A$  - изтуджена

$C \rightarrow AF$  - није изтуджена

$CD \rightarrow F$  - није изтуджена,  $CD \rightarrow EG$  - изтуджена

K2-18 7

57

②  $R(S, T, E, F, A, N)$

$$F = \{SN \rightarrow A, FT \rightarrow N, TS \rightarrow EA, EF \rightarrow ST\}$$

a) i:

ii: F

iii: A

iv: S, T, E, N

$$(F)^+ = F$$

$$(FS)^+ = FS, (FT)^+ = FTN, (FN)^+ = FN$$

$$(FE)^+ = FE ST NA \Rightarrow \text{KK}$$

$$(FST)^+ = FST NEA \Rightarrow \text{KK}$$

$$(FSN)^+ = FSNA, (FTN)^+ = FTN$$

$$\Rightarrow \text{KK} = \{FE, FST\}$$

| $\delta)$ | $SN \rightarrow A$ | $FT \rightarrow N$ | $TS \rightarrow EA$ | $EF \rightarrow ST$ |
|-----------|--------------------|--------------------|---------------------|---------------------|
| BCNF      | x                  | x                  | x                   | ✓                   |
| 3NF       | x                  | x                  | x                   | ✓                   |
| 2NF       | ✓                  | x                  | x                   | ✓                   |

FN K2-18 D

$$② 6) F = \{ SN \rightarrow A, FT \rightarrow N, TS \rightarrow EA, EF \rightarrow ST \}$$

$$SN \rightarrow A : \exists S (N)^+ = N, (\exists) N (S)^T = S$$

$$SN \rightarrow A : \exists A (SN)^+ = SN$$

$$FT \rightarrow N : \exists N (FT)^+ = FT$$

$$TS \rightarrow EA : \exists E (TS)^+ = TSA, \exists A (TS)^T = TSE$$

$$EF \rightarrow ST : \exists S (EF)^+ = EFTN, \exists T (EF)^+ = EFS$$

$$\Rightarrow F_c = \{ SN \rightarrow A, FT \rightarrow N, TS \rightarrow EA, EF \rightarrow ST \}$$

$$R_1(S, N, A), R_2(E, T, N), R_3(T, S, E, A),$$

$$R_n(E, F, S, T)$$

$$T) R(S, T, E, F, A, N), F = \{ SN \rightarrow A,$$

$$\rightarrow R_1(S, N, A), F = \{ SN \rightarrow A \}$$

$$\rightarrow R'(S, T, E, F, N), F = \{ FT \rightarrow N,$$

$$\rightarrow R_2(F, T, N), F = \{ FT \rightarrow N \}$$

$$\rightarrow R''(S, T, E, F), F = \{ TS \rightarrow E,$$

$$\rightarrow R_3(T, S, E), F = \{ TS \rightarrow E \}$$

$$\rightarrow R_n(S, T, F), F = \{ \}$$

3) TS  $\rightarrow$  A - изгублена, EF  $\rightarrow$  ST - изгублена

K2-22

5n

①  $R(A, B, C, D, E, F, G)$

$F = \{ AE \rightarrow D, CG \rightarrow DEF, F \rightarrow AG, CDG \rightarrow \cancel{EF}, CF \rightarrow DG \}$

a)  $C: B$

iii)  $C$

iii)

iv)  $A, D, E, F, G$

$$(BC)^+ = BC$$

$$(BCA)^+ = BCA$$

$$(BCD)^+ = BCD$$

$$(BCE)^+ = BCE$$

$$(BCF)^+ = BCFA GDE \Rightarrow \text{KK}$$

$$(BCG)^+ = BCGDEFA \Rightarrow \text{KK}$$

$$(BCAD)^+ = BCAD$$

$$(BCAE)^+ = BCAED$$

$$(BCDE)^+ = BCDE$$

$$(BCADE)^+ = BCADE$$

$$\Rightarrow \text{KK} = \{ BCF, BCG \}$$

50 12-22

② 8)

|      | $AE \rightarrow D$ | $CG \rightarrow DEF$ | $F \rightarrow AG$ | $CDG \rightarrow DF$ | $CF \rightarrow DG$ |
|------|--------------------|----------------------|--------------------|----------------------|---------------------|
| BCNF | X                  | X                    | X                  | X                    | X                   |
| 3NF  | X                  | X                    | X                  | ✓                    | X                   |
| 2NF  | ✓                  | X                    | X                  | ✓                    | X                   |

Q)  $F = \{AE \rightarrow D, CG \rightarrow DEF, F \rightarrow AG, \cancel{CDG \rightarrow DF}, \cancel{CF \rightarrow DG}\}$

$$AE \rightarrow D : \neg A (E)^+ = E, \neg E (A)^+ = A$$

$$CG \rightarrow DEF : \neg C (G)^+ = G, \neg G (C)^+ = C$$

$$CDG \rightarrow F : \neg C (DG)^+ = DG, \neg D (CG)^+ = CGDEF, \neg G (C)^+ = C$$

$$CF \rightarrow DG : \neg C (F)^+ = FAG, \neg F (C)^+ = C$$

$$AE \rightarrow D : \neg D (AE)^+ = AE$$

$$CG \rightarrow DEF : \neg D (CG)^+ = CGEFAD$$

$$F \rightarrow AG : \neg A (F)^+ = FG, \neg G (F)^+ = FA$$

$$CF \rightarrow DG : \neg D (CF)^+ = CFGEFAD, \neg G (CF)^+ = CFAG$$

$$\Rightarrow F_c = \{AE \rightarrow D, CG \rightarrow EF, F \rightarrow AG\}$$

$$\underline{R_1(A, E, D)}, \underline{R_2(C, G, E, F)}, \underline{R_3(F, A, G)}, \underline{R_4(B, C, F)}$$

① T)  $F = \{AE \rightarrow D, CG \rightarrow DEF, F \rightarrow AG, CDG \rightarrow F, CF \rightarrow DG\}$

$R(A, B, C, D, E, F, G), F = \{AE \rightarrow D, \dots\}$

$\rightarrow R_1(A, E, D), F = \{AE \rightarrow D\}$

$\rightarrow R'_1(A, B, C, E, F, G), F = \{CG \rightarrow EF, \dots\}$

$\rightarrow R'_1(C, G, E, F), F = \{CG \rightarrow EF, F \rightarrow G, \dots\}$

$\rightarrow R_2(F, G), F = \{F \rightarrow G\}$

$\rightarrow R_3(C, E, F), F = \{CF \rightarrow E\}$

$\rightarrow R'_2(A, B, C, G), F = \{CG \rightarrow A, \dots\}$

$\rightarrow R_4(C, G, A), F = \{CG \rightarrow A\}$

$\rightarrow R_5(B, C, G), F = \{\}$

g)  $AE \rightarrow D$  - није изведена

$CG \rightarrow DEF$  - изведена

$F \rightarrow A$  - изведена,  $F \rightarrow G$  - није изведена

$CDG \rightarrow F$  - изведена

$CF \rightarrow DG$  - није изведена