So, it is in '3NF'.

8) BCNF

v) AB → C , LHS has 'Key'
C → A → LHS has 'no key'

A) So, not in 'BCNF'.
B) Keys → AB, BC //

9) i) Key → A, EF, D, BC
Prime → A, B, C, D, E, F
Non " → None.

A → BC (3NF)
DC → D
D → EF
EF → A

ii) No partial dependency → 2NF
iii) No transitional " → 3NF //

A
A → B, C, D, E, F

DBMS

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1) R(A, B, C, D, E) , FD → AB → C
D → E

(i) Prime attributes → A, B, D
Non " " → C, E.

(ii) Candidate Key → ABD

(iii) Partial dependency, D → E, AB → C

(iv) R_1(A, B, D) R_2(A, B, C) R_3(D, E)

~~AB → C~~ {AB → C} {D → E.}
Key :- ABD
Key → AB Key → D.

2) R(A, B, C, D, E) , FD = A → C, C → D, ~~DB~~ → E

i) Candidate Key → AB
ii) Prime → A, B
iii) Non-prime → C, D, E.

A → A, C, D
AB → A, B, C, D, E

iii) Partial dependency? A → C, B → E.
D

Remove 'C' and 'E' from 'R' table.

R1(A, B, D) R2(A, C) R_3(B, E)

Key → AB
AB → CE

FD = A → C
Key → A

FD = B → E
Key → B

A → C
C → D
A → D [Transitivity rule]

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

Key -> AB | Key => A, FD = A -> CD | Key -> B, FD = B -> E

3) $R(A, B, C, D, E, F)$, $FD = \{A \to BCF, C \to DE\}$

$A \to_A B, C, F, D, F$

upto => 3NF

2NF

i) Candidate Key = A
ii) Prime = A
Non-prime = B, C, D, E, F

iii) partial dependency => $A \Rightarrow BCF$

$R_1(A, D, E)$ — Key

$R_2(A, B, C, F)$ — $A \Rightarrow BCF$, ~~Key = A~~

iii) No partial dependency, already in '2NF'

3NF

iv) $A \to BCF$
$C \to DE$
$A \to DE$ [Transitive dependency].

DE -> Transitively dependent on 'DE'
Remove 'DE' from original table.

$R_1(A, B, C, F)$ — $A \to BCF$

$R_2(C, D, E)$ — $C \to DE$

4) $R(A, B, C, D, E)$, $FD = AC \to B$, $C \to D$, $D \to E$.

2NF

$A \to A, C, B, D, E$

i) Candidate Key → ACF

ii) Prime → A, C, F

Non-prime → B, D, E

iii) Partial dependency, $C \to D$, $D \to E$ and $C \to E$

Remove 'D' from original table.

$R_1(A, B, C)$ $R_2(C, D, E)$

$AC \to B$ $C \to D$, $D \to E$

Partial dependency removed, 2NF satisfied.

iv) 3NF

$R_1(A, B, C)$, $R_2(C, D, E)$

$AC \to B$ $C \to D$, $C \to E$

Key → AC Key → C

$C \to D$

$C \to E$

iii) partial dependency → $AC \to B$, $C \to D$, $D \to E$.

$C \to D \Rightarrow C \to E$ Remove 'B, D and E' from original table.

$D \to E$

iv) $R_1(A, C, F)$ $R_2(A, B, C)$ $R_3(C, D, E)$

Key → ACF. $AC \to B$ $C \to D$

Key → AC $D \to E$

Key → C

3NF

v) Transitive dependency? $C \to D$, $D \to E$ $\Rightarrow$ $C \to E$

(Key) (Non-prime.)

'E' is transitive dependent on Key (C).

So, remove 'E' from original table, R3

$R_1(A, C, F)$ $R_2(A, B, C)$ $R_{3_1}(C, D)$ $R_4(C, E)$

Key → ACF $AC \to B$ $C \to D$ $C \to E$

Key → AC Key → C Key → C.

5) $R(A, B, C, D, E, F, G, H, I, J)$, $AC \to B$, $A \to J$, $CD \to GH$, $AD \to EF$, $F \to I$

i) Candidate Key → ABCD

ii) Prime → A, B, C, D

Non-prime → E, F, G, H, I, J

ABCD → A, B, C, D, J, E, F, G, H, I

ii) partial dependency → $CD \to GH$, $A \to J$, $AD \to EF$, $AC \to B$

Remove 'GH', 'J', 'EF' and 'B' from original table.

A, C, D

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

Key → ~~A~~CD & $CD \to GH$ $A \to J$ $AD \to EF$

ACD $F \to I$

$R_5(A, B, C)$

$AC \to B$

$A \to F$

$F \to I$

$R_5(A,B,C)$
$AC \to B$

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

Key → ACD | CD → GH, Key → CD. | A → J, Key → A | AD → EF, F → I, Key → AD

3NF

v) Transitive dependency ?

~~AD → EF~~ ~~F → I~~ ⟹ A → F ⟹ A → I.
F → I

'I' is transitively dependent on key 'A'.
Remove 'I' from the original table 'R_4'.

$R_1(ACD)$ $R_2(C,D,G,H)$ $R_3(A,J)$ $R_{41}(A,D,E,F)$

Key → ACD | CD → GH, Key → CD | A → J, Key → A | AD → EF

$R_{42}(F,I)$ So, '3NF' is satisfied. //

$F \to I$

$R5(A,B,C)$ //

$AC \to B$

6) $R(A,B,C,D)$, $AB \to CD$
$C \to A$

AB → AB, C, D
B →
→ CD OR BC

i) Key → AB, BC,
ii) Prime → A, B, C
Non-prime → D

iii) partial dependency → None

(2NF) satisfied

iv) Transitive dependency → None

(3NF) satisfied

option (c) (3NF) //

7) i) Candidate Key → ABY, ACY, BCY

ii) Prime → A, B, Y, C

Non-prime → D, E, X.

AB→A, B, C, D, E, X, M

ABY →

ABY AC→B

AACY AB→A

ACY

BBCY

BCY

iii) No partial dependency, (2NF) satisfied

iv) No

iii) partial dependency, B→D

So, (1NF), option 'A' //

AB→C AB

C→A ABC

BC→B, C, A

8) i) Candidate Key = AB, BC

ii) Prime → A, B, C

No-prime → None.

iii) No partial dependency → So, (2NF)

iv) No transition " → So, (3NF)

As, there is no non-prime attributes.