01. Consider relation R(A, B, C, D, E), and following FDs-

A →{B, C}
C →{D, E}

Key: $A^+ = ABCDE$ (A)

FD $C \rightarrow D$ and $C \rightarrow E$ violates BCNF requirement

BCNF: NO

3NF: same set of FD's violate

NO

2NF: YES

2NF

02. Consider relation R(A, B, C, D, E), and following FDs-

$\{A,B\} \rightarrow C$

$C \rightarrow B$

$A \rightarrow D$

Key : ABE, ACE

$AB^+ = ABCD \Rightarrow ABE$

$AC^+ = ABCD \Rightarrow ACE$

BCNF : ? NO. All FD's violate

3NF : ? NO.

2NF : Non prime attributes D transitively dependent on Key.

NO

1NF

03. Consider relation R(A, B, C, D), and following FDs-

$AB \rightarrow C$

$B \rightarrow D$

$D \rightarrow A$

Key: B

$AB^+ = ABCD$

$B^+ = BDAC$

BCNF: NO. FD $D \rightarrow A$ violates the rq.

3NF: NO. $D \rightarrow A$ violates

2NF: Yes.

Non Prime attrib C, D, A

A is redundant in $AB \rightarrow C \Rightarrow B \rightarrow C$

2NF

04. Consider relation R(A, B, C, D, E), and following FDs-

$A \rightarrow B$
$A \rightarrow C$
$B \rightarrow D$
$D \rightarrow E$

Key: (A)

$A^+ = ABCDE$

BCNF: NO. $B \rightarrow D$ and $D \rightarrow E$ violates

3NF: NO.

2NF: Yes.

05. Consider relation R(A, B, C, D, E, F), and following FDs

A → B

B → {C, E, F}

Key : (AD)

$A^+ = ABCEF \Rightarrow AD$

BCNF : NO. $B \rightarrow \{C, E, F\}$ violates

3NF : NO.

2NF : NO. as not all non-prime attributes are irreducibly depend on Key.

1NF

06. Consider relation R(A, B, C, D), and following FDs

$AB \rightarrow CD$
$B \rightarrow C$
$C \rightarrow D$

Key : AB

$AB^+ = ABCD$

$B^+ = BCD$

BCNF : NO. $B \rightarrow C$, $C \rightarrow D$

3NF : NO.

2NF : NO. Non prime C, D are reducibly depend on Key.

1NF

07. Consider relation R(A, B, C, D), and following FDs

$A \rightarrow BC$
$B \rightarrow C$
$A \rightarrow B$
$AB \rightarrow C$

Key: AD
$A^+ = ABC$

BCNF: NO. $A \rightarrow B$, $B \rightarrow C$
violates the req.

3NF: NO.

$A \rightarrow B$
~~$A \rightarrow C$~~ (tr)
$B \rightarrow C$
~~$A \rightarrow B$~~
~~$AB \rightarrow C$~~
~~$B \rightarrow C$~~

08. Consider relation R(A, B, C, D), and following FDs

$A \rightarrow B$

$AB \rightarrow CD$

$C \rightarrow D$

Key: A

BCNF: NO.

$C \rightarrow D$ culprit FD

3NF: NO.

2NF: YES

$A \rightarrow B$

$A \rightarrow C$

~~$A \rightarrow D$~~ transitive

$C \rightarrow D$

09. Consider relation R(A, B, C, D), and following FDs

$ABC \rightarrow D$

$A \rightarrow B$

Key: AC

BCNF: NO. $A \rightarrow B$ Culprit

3NF: NO.

2NF: NO. Non prime attribute B reducibly depend on Key.

$ABC \rightarrow D$

$A \rightarrow B$

$AC \rightarrow ABC$

$\Rightarrow$ $AC \rightarrow D$ (1)

$A \rightarrow B$ (2)

F_{min}

1NF

10. Consider relation Book(AccessonNo, ISBN, Title, Author, Publisher, Price), and following FDs

AccessonNo →{ISBN}

ISBN →{Title, Publisher, Price}

Key: AccessonNO, Author

BCNF : NO. All FD violates the req.

3NF : NO.

2NF : NO.

11. Consider relation Book(ISBN, Title, Author, Publisher, Price)

ISBN →{Title, Publisher, Price}

Key : {ISBN, Author}

BCNF : NO.

3NF : NO.

2NF : NO.

12. Consider relation Member(MemID, Name, Type, NoOfBooksCanBeIssued, IssueDuration), and following FDs –

1. MemID → Name
2. MemID → Type
3. Type → NoOfBooksCanBeIssued
4. Type → IssueDuration

Key : MemId

BCNF : NO. FD (3) and (4) are culprits

3NF : NO. "

2NF : YES

13. Consider relation Medicine (TradeName, GenericName, BatchNo, Stock, MRP, TaxRate, Manufacturer)

1. TradeName → GenericName
2. TradeName → Manufacturer
3. BatchNo → TradeName
4. BatchNo → Stock
5. BatchNo → MRP
6. GenericName → TaxRate

Key : BatchNO

BCNF : NO. 1, 2, 6 violate the req.

3NF : NO "

2NF : YES

14. Consider relation **R (StudID, SName, CPI_UptoDate, CPI_UptoASem, SPI, AcadYr, Sem, ProgCode, CourseNo, Grade)**. Holds following FDs

StudID → {CPI_**UptoDate**, ProgCode, SName}
{StudID, AcadYr, Sem} → {SPI, **CPI_UptoASem}**
{StudID, AcadYr, Sem, CourseNo} → Grade

Key : {S ID, AcadYr, Sem, CourseNO}

BCNF : NO.
3NF : NO.
2NF : NO.

15. Relation **IssueLog**(IssueDate, MemberID, AccessonNo, DueDate, ReturnDate), and Following functional dependencies-
{MemberID, AccessonNo, IssueDate} → {DueDate, ReturnDate}

Key : {MemId, AdessonNO, Issue Date}

BCNF : Yes.

16. Consider relation R(A, B, C), and following FDs-

{A, B} → C
C → B

Key: AB
BCNF: NO. C → B culprit
3NF: Yes in C → B, B is prime attribute.

17. Consider relation R(A, B, C, D, E, F), and following FDs-

A → {B, D, E}
F → {A}

Key: FC $FC^+ = FCABDE$
BCNF: NO. 3NF: NO. 2NF: NO.

18. Consider relation R(A, B, C, D, E), and following FDs-

A → B
A → C
C → D
C → E

Key : A
BCNF : NO. C → D, C → E
3NF : NO.
2NF : Yes

19. Consider relation R(A, B, C, D, E, F), and following FDs-
(Same as previous one except that R has got an additional attribute F)

A → B
A → C
C → D
C → E

Key : AF
BCNF : NO. 3NF : NO. 2NF : NO

20. Consider relation R(S#, SName, P#, QTY), SName is unique. Holds following FDs

1 {S#,P#} → QTY
2 {SNAME, P#} → QTY
3 S# → SNAME
4 SNAME → S#

Key : {S#, P#} , {SNAME, P#}

BCNF : NO. FD ② & ③ violate the rule

3NF : YES. In both FD's RHS is Prime Attrib

21. Consider relation R(S#, SName, P#, QTY), SName is unique. Holds following FDs

{S#,P#} → QTY
S# → SNAME

Key : {S#, P#}

BCNF : NO 3NF : NO. 2NF : NO.

22. Relation **UserDetails**(UserID, PWD, Fname, Mname, Lname, Mobile, CityID, CategoryID)

UserID → {PWD, Fname, Mname, Lname, Mobile, CityID, CategoryID}
Mobile → {UserID, PWD, Fname, Mname, Lname, CityID, CategoryID}

Key : {UserId}, {Mobile}

BCNF : Yes.