Question 01

SID	CID	S_name	C_name	Grade	F_Name	F_phone
1	IS318, IS301	Adams	Database, EC	A,B	Howser, Langley	60192, 45869
2	IS318	Jones	Database	A	Howser	60192
3	IS318	Smith	Database	B	Howser	60192
4	IS301, IS318	Baker	EC, Database	A,B	Langley, Howser	45869, 60192

Functional Dependencies are:

SID → S_name *SID and CID → Grade* *CID->C_name*

CID → F_Name *F_Name → F_phone*

Solution :

Put the above table in 1NF Tables

SID	CID	S_Name	C_Name	Grade	F_Name	F_phone
1	IS318	Adams	Database	A	Howser	60192
1	IS301	Adams	EC	B	Langley	45869
2	IS318	Jones	Database	A	Howser	60192
3	IS318	Smith	Database	B	Howser	60192
4	IS301	Baker	EC	A	Langley	45869
4	IS318	Baker	Database	B	Howser	60192

Put the above table in 2NF

Primary Key for the table would be combination of SID,CID

(SID,CID)* => SID, CID, S_name, Grade, C_name,F_name, F_phone

S_name is Partially dependent on (SID,CID)
C_name, F_name is Partially dependent on (SID,CID)

In 2NF we need to remove Partial Dependency. So we will modify the table to remove partial dependency.

Students Table with SID as PK

SID	S_Name
1	Adams
2	Jones
3	Smith
4	Baker

Courses Table with CID as PK

CID	C_Name	F_Name	F_phone
IS318	Database	Howser	60192
IS301	EC	Langley	45869

Grades Table with SID as FK referencing to Students Table and CID as FK referencing to Customers Table

SID	CID	Grade
1	IS318	A
1	IS301	B
2	IS318	A
3	IS318	B
4	IS301	A
4	IS318	B

Put the above table in 3NF Tables

For tables to be in 3NF there should be no transitive dependency.
In Students Table,
We have FD : SID => S_name which is not TD
In Grades Table,
We have FD : SID,CID => Grade which is not TD
In Courses Table,
We have FD : CID => C_name not a TD
CID => F_name not a TD
F_name => F_phone is a TD
So we need to make changes in the Courses Table and rectify TD.

We divide it into two tables: Courses Table(with F_name as FK) and Faculties Table(F_name as PK).

CID	C_Name	F_Name		F_Name	F_phone
IS318	Database	Howser		Howser	60192
IS301	EC	Langley		Langley	45869

Final set of Tables with meaningful names and PKs and FK

Table 1 : Students { SID(Primary Key), S_name }
Table 2 : Courses { CID(Primary Key), C_name, F_name(Foreign Key) }
Table 3 : Faculties { F_name(Primary Key), F_phone }
Table 4 : Grades { SID(Foreign Key), CID(Foreign Key), Grade }

Question 02

Functional Dependencies are:

OID -> O_Date CID -> C_Name PID -> P_Desc PID -> P_Price
OID -> CID CID -> C_State PID and OID -> Qty

OID	O_Date	CID	C_Name	C_State	PID	P_Desc	P_Price	Qty
1006	10/24/09	2	Apex	NC	7, 5, 4	Table, Desk, Chair	800, 325, 200	1, 1, 5
1007	10/25/09	6	Acme	GA	11, 4	Dresser, Chair	500, 200	4, 6

Solution :

Put the above table in 1NF Tables

OID	O_Date	CID	C_Name	C_State	PID	P_Desc	P_Price	Qty
1006	10/24/09	2	Apex	NC	7	Table	800	1
1006	10/24/09	2	Apex	NC	5	Desk	325	1
1006	10/24/09	2	Apex	NC	4	Chair	200	5
1007	10/25/09	6	Acme	GA	11	Dresser	500	4
1007	10/25/09	6	Acme	GA	4	Chair	200	6

Put the above table in 2NF

Primary Key for the table would be combination of OID,PID
(OID,PID)* => OID, O_Date, CID, C_Name, C_State, PID, P_Desc, P_Price, Qty

O_Date is Partially dependent on (OID,PID)
P_Desc is Partially dependent on (OID,PID)
P_Price is Partially dependent on (OID,PID)
CID is Partially dependent on (OID,PID)

In 2NF we need to remove Partial Dependency. So we will modify the table to remove partial

dependency.

Products table with PID as Primary Key

PID	P_Desc	P_Price
7	Table	800
5	Desk	325
4	Chair	200
11	Dresser	500

Orders table with OID as Primary Key

OID	O_Date	CID	C_Name	C_State
1006	10/24/09	2	Apex	NC
1007	10/25/09	6	Acme	GA

Quantity table with OID as Foreign Key referencing Orders Table, PID as Foreign Key referencing Products table.

OID	PID	Qty
1006	7	1
1006	5	1
1006	4	5
1007	11	4
1007	4	6

Put the above table in 3NF Tables

For tables to be in 3NF there should be no transitive dependency.

In Products Table,
We have FD : PID => P_desc — not a TD
PID => P_price — not a TD
In Quantity Table,
We have FD : PID,OID => Qty — not a TD
In Orders Table,
We have FD : OID => O_date — not a TD
OID => CID — not a TD
CID => C_name — is a TD
CID => C_state — is a TD
So we need to make changes in the Orders Table and rectify TD.

We divide it into two tables: Orders Table(with CID as FK) and Customers Table(CID as PK).

OID	O_Date	CID
1006	10/24/09	2
1007	10/25/09	6

CID	C_Name	C_State
2	Apex	NC
6	Acme	GA

Final set of Tables with meaningful names and PKs and FK

Table 1 : Customers { CID(Primary Key), C_name, C_state }
Table 2 : Orders { OID(Primary Key), O_date, CID(Foreign Key) }
Table 3 : Products { PID(Primary Key), P_desc, P_price }
Table 4 : Quantity { OID(Foreign Key), PID(Foreign Key), Qty }

Question 03

Functional Dependencies are:

DID → Dname EID → Ename EID and PID →Btime
EID → DID PID → Pname

DID	Dname	EID	Ename	PID	Pname	Btime
10	Finance	1, 5, 11	Huey, Dewey, Louie	27, 25, 22	Alpha, Beta, Gamma	4.5, 3, 7
14	R&D	2, 4,	Jack, Jill	26, 21	Pail, Hill	8, 9

Solution :

Put the above table in 1NF Tables

DID	Dname	EID	Ename	PID	Pname	Btime
10	Finance	1	Huey	27	Alpha	4.5
10	Finance	5	Dewey	25	Beta	3
10	Finance	11	Louie	22	Gamma	7
14	R&D	2	Jack	26	Pail	8
14	R&D	4	Jill	21	Hill	9

Put the above table in 2NF

Primary Key for the table would be combination of EID,PID
(EID,PID)* => EID, Ename, DID, Dname, PID, Pname, Btime

Ename is Partially dependent on (EID,PID)
DID is Partially dependent on (EID,PID)
Pname is Partially dependent on (EID,PID)

In 2NF we need to remove Partial Dependency. So we will modify the table to remove partial dependency.

Projects Table with PID as PK

PID	Pname
27	Alpha
25	Beta
22	Gamma
26	Pail
21	Hill

Employees table with EID as PK

EID	Ename	DID	Dname
1	Huey	10	Finance
5	Dewey	10	Finance
11	Louie	10	Finance
2	Jack	14	R&D
4	Jill	14	R&D

Budgeted_Time table with EID as Foreign Key referencing Employees Table, PID as Foreign Key referencing Projects table.

EID	PID	Btime
1	27	4.5
5	25	3
11	22	7
2	26	8
4	21	9

Put the above table in 3NF Tables

For tables to be in 3NF there should be no transitive dependency.

In Projects Table,
We have FD : PID => Pname not a TD
In Budgeted_Time Table,
We have FD : EID,PID => Btime not a TD
In Employees Table,
We have FD : EID => Ename not a TD
EID => DID not a TD
DID => Dname is a TD

So we need to make changes in the Employees Table and rectify TD.

We divide it into two tables: Employees Table(with DID as FK) and Departments Table(DID as PK).

EID	Ename	DID
1	Huey	10
5	Dewey	10
11	Louie	10
2	Jack	14
4	Jill	14

DID	Dname
10	Finance
14	R&D

Final set of Tables with meaningful names and PKs and FK

Table 1 : Projects { PID(Primary Key), Pname}
Table 2 : Employees { EID(Primary Key), Ename, DID(Foreign Key) }
Table 3 : Departments { DID(Primary Key), Dname }
Table 4 : Budgeted_Time { EID(Foreign Key), PID(Foreign Key), Btime }