Data of Parking System Report

staff id	given names	family name	permit reservation id	permit from date	permit to date	permit for number plate	staff card id	card issue date	entry attempt id	parking area id	entry datetime	exit datetime
5100	Madge	Gardner	GenRes25633	2021-01-01	2021-06-30	XGC163	516669	1995-06-01	7315	Lot A	2021-02-16 (09:02)	2021-02-16 (16:42)
5100	Madge	Gardner	GenRes25633	2021-01-01	2021-06-30	XGC163	516669	1995-06-01	7505	Lot D	2021-02-17 (09:00)	2021-02-17 (17:24)
5100	Madge	Gardner	GenRes58809	2021-07-01	2021-12-31	XGC163	516669	1995-06-01	8947	Lot A	2021-08-17 (09:09)	2021-08-17 (17:47)
5100	Madge	Gardner	GenRes58809	2021-07-01	2021-12-31	XGC163	516669	1995-06-01	8950	Lot A	2021-08-17 (09:17)	2021-08-17 (18:39)
5162	Barry	Holden	GenRes22285	2021-01-01	2021-06-30	ZLR111	873686	1995-06-01	7318	Lot A	2021-02-16 (09:04)	2021-02-16 (17:13)
5162	Barry	Holden	GenRes22285	2021-01-01	2021-06-30	ZLR111	873686	1995-06-01	7506	Lot C	2021-02-17 (09:00)	2021-02-17 (16:12)
5162	Barry	Holden	GenRes58514	2021-07-01	2021-12-31	QQQ666	873686	1995-06-01	8958	Lot E	2021-08-17 (09:15)	2021-08-17 (18:36)
5162	Barry	Holden	GenRes58514	2021-07-01	2021-12-31	QQQ666	873686	1995-06-01	8959	Lot A	2021-08-17 (09:11)	2021-08-17 (17:06)
5188	Pomona	Ford	GenRes28525	2021-01-01	2021-06-30	YVC982	571651	1995-06-01	7326	Lot E	2021-02-16 (09:04)	2021-02-16 (17:56)
5188	Pomona	Ford	GenRes28525	2021-01-01	2021-06-30	YVC982	571651	1995-06-01	7518	Lot B	2021-02-17 (09:04)	2021-02-17 (16:16)
5188	Pomona	Ford	GenRes53791	2021-07-01	2021-12-31	YVC982	571651	1995-06-01	8971	Lot C	2021-08-17 (09:23)	2021-08-17 (17:32)
5188	Pomona	Ford	GenRes53791	2021-07-01	2021-12-31	YVC982	571651	1995-06-01	8973	Lot C	2021-08-17 (09:17)	2021-08-17 (17:13)
5200	Sybill	Bradford	GenRes28619	2021-01-01	2021-06-30	BBB333	177214	2000-05-15	7327	Lot A	2021-02-16 (09:04)	2021-02-16 (17:28)
5200	Sybill	Bradford	GenRes28619	2021-01-01	2021-06-30	BBB333	177214	2000-05-15	7526	Lot B	2021-02-17 (09:08)	2021-02-17 (17:17)
5200	Sybill	Bradford	GenRes59281	2021-07-01	2021-12-31	XYU534	177214	2000-05-15	9137	Lot D	2021-08-18 (09:03)	2021-08-18 (17:27)
5200	Sybill	Bradford	GenRes59281	2021-07-01	2021-12-31	XYU534	177214	2000-05-15	9138	Lot C	2021-08-18 (09:04)	2021-08-18 (17:57)
5263	John	Sally	GenRes21003	2021-01-01	2021-06-30	MQU221	711876	1998-08-14	7339	Lot C	2021-02-16 (09:20)	2021-02-16 (17:00)
5263	John	Sally	GenRes21003	2021-01-01	2021-06-30	MQU221	711876	1998-08-14	7520	Lot B	2021-02-17 (09:04)	2021-02-17 (16:44)
5263	John	Sally	GenRes54902	2021-07-01	2021-12-31	MQU221	9059214	2021-06-23	9143	Lot A	2021-08-18 (09:07)	2021-08-18 (18:00)
5263	John	Sally	GenRes54902	2021-07-01	2021-12-31	MQU221	9059214	2021-06-23	9150	Lot B	2021-08-18 (09:15)	2021-08-18 (16:41)
5268	Alex	Sanchez	GenRes26719	2021-01-01	2021-06-30	GXD746	959214	1995-06-01	7341	Lot C	2021-02-16 (09:04)	2021-02-16 (17:57)
5268	Alex	Sanchez	GenRes26719	2021-01-01	2021-06-30	GXD746	959214	1995-06-01	7511	Lot A	2021-02-17 (09:03)	2021-02-17 (18:39)
5268	Alex	Sanchez	GenRes57895	2021-07-01	2021-12-31	GXD746	959214	1995-06-01	9152	Lot A	2021-08-18 (09:09)	2021-08-18 (16:50)
5268	Alex	Sanchez	GenRes57895	2021-07-01	2021-12-31	GXD746	959214	1995-06-01	9158	Lot B	2021-08-18 (09:12)	2021-08-18 (16:52)

- The relation 'Entry Data' has only single valued attributes. This satisfy the 1NF condition.
- The relation 'Entry Data' has only one primary key 'Entry attempt ID'.
- Therefore, the given data is in 1NF (First Normal Form).

Second Normal Form to Third Normal Form:

- A relation will be in 3NF if it is in 2NF and not contain any transitive partial dependency.
- If there is no transitive dependency for non-prime attributes, then the relation must be in third normal form.

Step1: Here, 'given names' & 'family name' dependent on 'staff id' and 'staff id' dependent on 'entry attempt id'. The non-prime attributes ('given names' & 'family name') transitively dependent on super key ('entry attempt id'). It violates the rule of third normal form. That's why we need to move the 'given names' & 'family name' to the new <Staff _Details> table, with 'staff id' as a Primary key.

Staff_Details		
staff id	given names	family name
5100	Madge	Gardner
5162	Barry	Holden
5188	Pomona	Ford
5200	Sybill	Bradford
5263	John	Sally
5268	Alex	Sanchez

Step2: Here, 'permit from date', 'permit to date' & 'permit for number plate' dependent on 'permit reservation id' and 'permit reservation id' dependent on 'entry attempt id'. The non-

prime attributes ('permit from date', 'permit to date' & 'permit for number plate') transitively dependent on super key ('entry attempt id'). It violates the rule of third normal form. That's why we need to move the 'permit from date', 'permit to date' & 'permit for number plate' to the new <Permit _Details> table, with 'Permit Reservation id' as a Primary key.

Permit Details			
permit reservation id	permit from date	permit to date	permit for number plate
GenRes25633	2021-01-01	2021-06-30	XGC163
GenRes58809	2021-07-01	2021-12-31	XGC163
GenRes22285	2021-01-01	2021-06-30	ZLR111
GenRes58514	2021-07-01	2021-12-31	QQQ666
GenRes28525	2021-01-01	2021-06-30	YVC982
GenRes53791	2021-07-01	2021-12-31	YVC982
GenRes28619	2021-01-01	2021-06-30	BBB333
GenRes59281	2021-07-01	2021-12-31	XYU534
GenRes21003	2021-01-01	2021-06-30	MQU221
GenRes54902	2021-07-01	2021-12-31	MQU221
GenRes26719	2021-01-01	2021-06-30	GXD746
GenRes57895	2021-07-01	2021-12-31	GXD746

Step3: Here, 'card issue date' is dependent on 'staff card id' and 'staff card id' dependent on 'entry attempt id'. The non-prime attributes ('card issue date') transitively dependent on super key ('entry attempt id'). It violates the rule of third normal form. That's why we need to move the 'card issue date to the new <Card Data> table, with 'staff card id' as a Primary key.

Card Data	
staff card id	card issue date
516669	1995-06-01
873686	1995-06-01
571651	1995-06-01
177214	2000-05-15
711876	1998-08-14
9059214	2021-06-23
959214	1995-06-01

Step4: The <Entry Data Table> will be remained with 'entry attempt id' as a primary key and attributes – 'staff id', 'permit reservation id', 'staff card id', 'parking area id', 'entry date time', 'exit data time'.

entry attempt id	staff id	permit reservation id	staff card id	parking area id	entry datetime	exit datetime
				Entry Data		
7315	5100	GenRes25633	516669	Lot A	2021-02-16 (09:02)	2021-02-16 (16:42)
7505	5100	GenRes25633	516669	Lot D	2021-02-17 (09:00)	2021-02-17 (17:24)
8947	5100	GenRes58809	516669	Lot A	2021-08-17 (09:09)	2021-08-17 (17:47)
8950	5100	GenRes58809	516669	Lot A	2021-08-17 (09:17)	2021-08-17 (18:39)
7318	5162	GenRes22285	873686	Lot A	2021-02-16 (09:04)	2021-02-16 (17:13)
7506	5162	GenRes22285	873686	Lot C	2021-02-17 (09:00)	2021-02-17 (16:12)
8958	5162	GenRes58514	873686	Lot E	2021-08-17 (09:15)	2021-08-17 (18:36)
8959	5162	GenRes58514	873686	Lot A	2021-08-17 (09:11)	2021-08-17 (17:06)
7326	5188	GenRes28525	571651	Lot E	2021-02-16 (09:04)	2021-02-16 (17:56)
7518	5188	GenRes28525	571651	Lot B	2021-02-17 (09:04)	2021-02-17 (16:16)
8971	5188	GenRes53791	571651	Lot C	2021-08-17 (09:23)	2021-08-17 (17:32)
8973	5188	GenRes53791	571651	Lot C	2021-08-17 (09:17)	2021-08-17 (17:13)
7327	5200	GenRes28619	177214	Lot A	2021-02-16 (09:04)	2021-02-16 (17:28)
7526	5200	GenRes28619	177214	Lot B	2021-02-17 (09:08)	2021-02-17 (17:17)
9137	5200	GenRes59281	177214	Lot D	2021-08-18 (09:03)	2021-08-18 (17:27)
9138	5200	GenRes59281	177214	Lot C	2021-08-18 (09:04)	2021-08-18 (17:57)
7339	5263	GenRes21003	711876	Lot C	2021-02-16 (09:20)	2021-02-16 (17:00)
7520	5263	GenRes21003	711876	Lot B	2021-02-17 (09:04)	2021-02-17 (16:44)
9143	5263	GenRes54902	9059214	Lot A	2021-08-18 (09:07)	2021-08-18 (18:00)
9150	5263	GenRes54902	9059214	Lot B	2021-08-18 (09:15)	2021-08-18 (16:41)
7341	5268	GenRes26719	959214	Lot C	2021-02-16 (09:04)	2021-02-16 (17:57)
7511	5268	GenRes26719	959214	Lot A	2021-02-17 (09:03)	2021-02-17 (18:39)
9152	5268	GenRes57895	959214	Lot B	2021-08-18 (09:09)	2021-08-18 (16:50)
9158	5268	GenRes57895	959214	Lot B	2021-08-18 (09:12)	2021-08-18 (16:52)

Third Normal Form to BCNF:

- The table should be in the 3rd Normal Form.

- X should be a superkey for every functional dependency (FD) X–>Y in a given relation.

Entry Data						
entry attempt id	staff id	permit reservation id	staff card id	parking area id	entry datetime	exit datetime
7315	5100	GenRes25633	516669	Lot A	2021-02-16 (09:02)	2021-02-16 (16:42)
7505	5100	GenRes25633	516669	Lot D	2021-02-17 (09:00)	2021-02-17 (17:24)
8947	5100	GenRes58809	516669	Lot A	2021-08-17 (09:09)	2021-08-17 (17:47)
8950	5100	GenRes58809	516669	Lot A	2021-08-17 (09:17)	2021-08-17 (18:39)
7318	5162	GenRes22285	873686	Lot A	2021-02-16 (09:04)	2021-02-16 (17:13)
7506	5162	GenRes22285	873686	Lot C	2021-02-17 (09:00)	2021-02-17 (16:12)
8958	5162	GenRes58514	873686	Lot E	2021-08-17 (09:15)	2021-08-17 (18:36)
8959	5162	GenRes58514	873686	Lot A	2021-08-17 (09:11)	2021-08-17 (17:06)
7326	5188	GenRes28525	571651	Lot E	2021-02-16 (09:04)	2021-02-16 (17:56)
7518	5188	GenRes28525	571651	Lot B	2021-02-17 (09:04)	2021-02-17 (16:16)
8971	5188	GenRes53791	571651	Lot C	2021-08-17 (09:23)	2021-08-17 (17:32)
8973	5188	GenRes53791	571651	Lot C	2021-08-17 (09:17)	2021-08-17 (17:13)
7327	5200	GenRes28619	177214	Lot A	2021-02-16 (09:04)	2021-02-16 (17:28)
7526	5200	GenRes28619	177214	Lot B	2021-02-17 (09:08)	2021-02-17 (17:17)
9137	5200	GenRes59281	177214	Lot D	2021-08-18 (09:03)	2021-08-18 (17:27)
9138	5200	GenRes59281	177214	Lot C	2021-08-18 (09:04)	2021-08-18 (17:57)
7339	5263	GenRes21003	711876	Lot C	2021-02-16 (09:20)	2021-02-16 (17:00)
7520	5263	GenRes21003	711876	Lot B	2021-02-17 (09:04)	2021-02-17 (16:44)
9143	5263	GenRes54902	9059214	Lot A	2021-08-18 (09:07)	2021-08-18 (18:00)
9150	5263	GenRes54902	9059214	Lot B	2021-08-18 (09:15)	2021-08-18 (16:41)
7341	5268	GenRes26719	959214	Lot C	2021-02-16 (09:04)	2021-02-16 (17:57)
7511	5268	GenRes26719	959214	Lot A	2021-02-17 (09:03)	2021-02-17 (18:39)
9152	5268	GenRes57895	959214	Lot B	2021-08-18 (09:09)	2021-08-18 (16:50)
9158	5268	GenRes57895	959214	Lot B	2021-08-18 (09:12)	2021-08-18 (16:52)

The relation is in BCNF, as it is passing the condition of Super Key, that in functional dependency X–>Y, X is a **Super Key.**