Atal Bihari Vajpayee Indian Institute of Information Technology and Managemet

DBMS PROJECT

GROUP 9

TEAM MEMBERS

- 2021IMG-032 Lives Kumar Singh
- 2021IMG-033 Mithil Jogi
- 2021IMG-004 Akshitha Mittapally
- 2021IMG-022 Deepti Arya
- 2021IMG-001 Aakarshit Doda
- 2021IMG-015 Aradhya Shrivastava

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INTRODUCTION

- In our Mini DBMS-Project, we have designed the JoSAA Counselling System.
- The Joint Seat Allocation Authority (JoSAA) manages and regulates the joint seat allocation for admissions to 7 institutes each academic year after the successful conduction of the Joint Entrance Exam(JEE).
- Admissions to all the academic programs offered by these Institutes will be made through a single platform. The idea behind introducing a single counselling platform was to reduce thousands of seats going vacant in engineering colleges across the country.
- The Joint seat allocation process was introduced to make the whole admissions process smoother, effective, efficient, transparent and much faster.
- Only the candidates who qualify in JEE are allowed to participate in JoSAA. But they must register for JoSAA to participate in the counselling and admission process for various renowned engineering institutes across India.
- This system includes 3 IITs, 2 NITs and 2 IIITs.

INTRODUCTION

- Essential features of student name, address, DOB, payment ID and amount, list of Participating Institutes with the total number of seats, choices filled, result details, seat distribution in the Institutes, etc., are available in the system and interlinked.
- Cutoffs of courses offered in all the institutes are released after each round, namely round 1,2,3 and 4. The seat allotment result is released after every round. Candidates are allotted seats according to their merit(CRL Rank), preferences(Choices filled) and availability of the seats(No of seats).
- Candidates can fill in four choices of their will, selecting only the specific courses in which they seek admission. The system also stores the candidates' results, including CRL(Common Rank List) Rank and percentiles scored in both the JEE attempts.
- It is only based on the rank obtained by the student, the choices he filled and the cutoffs of those specific programs after each round that a student is finally allotted a seat in any participating institute.

Initial Schemas

Registration
RollNo.
Name
DOB
Address
Password
Payment_ID
Amount
Category

Institute
Insti_Name
CourseName
Website_link
city
state
No_of_seats

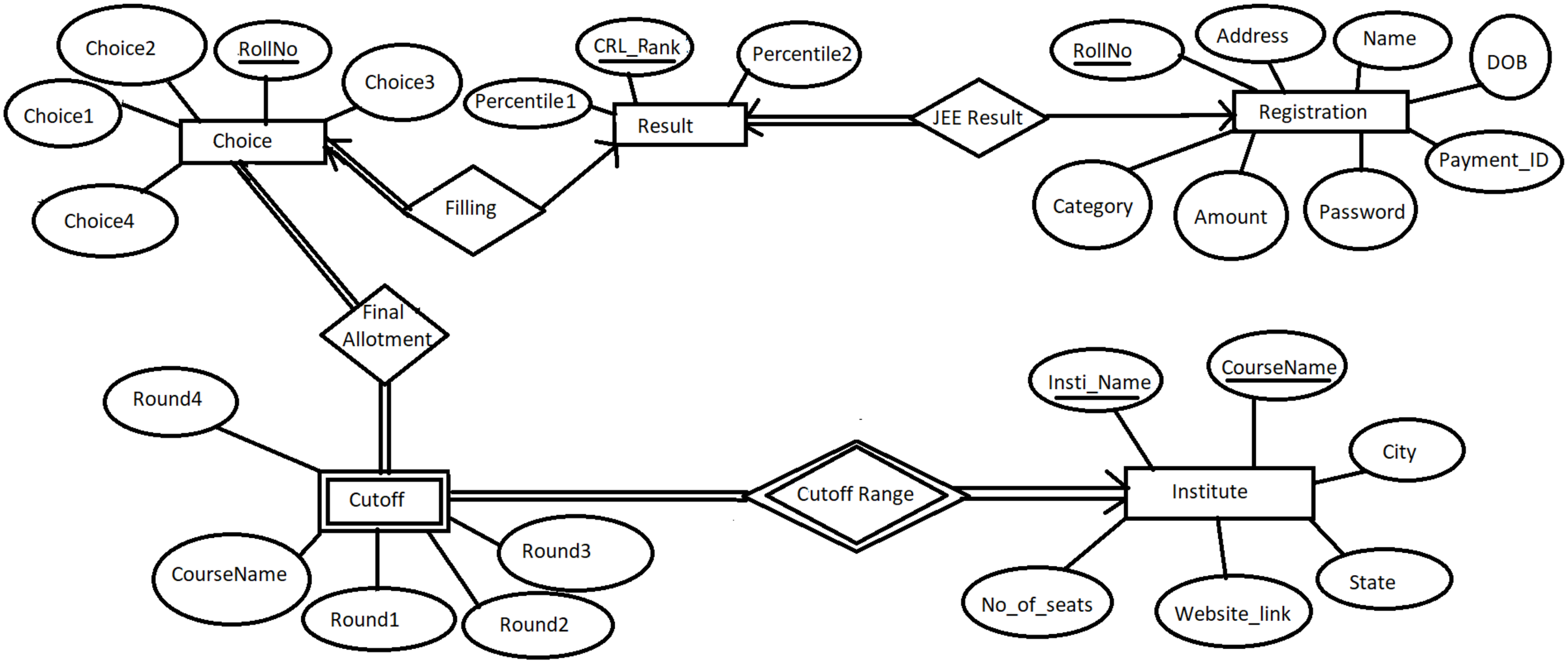
Initial Schemas

Result
CRL_Rank Percentile1 Percentile2

Cutoff
CourseName Round1 Round2 Round3 Round4

Choice
RollNo Choice1 Choice2 Choice3 Choice4

ER-DIAGRAM


Choice2
RollNo
Choice3
Choice1
Choice
Choice4
Percentile1
CRL_Rank
Percentile2
Result
Filling
JEE Result
RollNo
Address
Name
DOB
Registration
Payment_ID
Category
Amount
Password
Final Allotment
Round4
Cutoff
CourseName
Round1
Round2
Round3
Cutoff Range
Insti_Name
CourseName
City
Institute
No_of_seats
Website_link
State

Schemas After Decomposition of ER Diagram

Registration
RollNo. Name DOB Address Password Payment_ID Amount Category

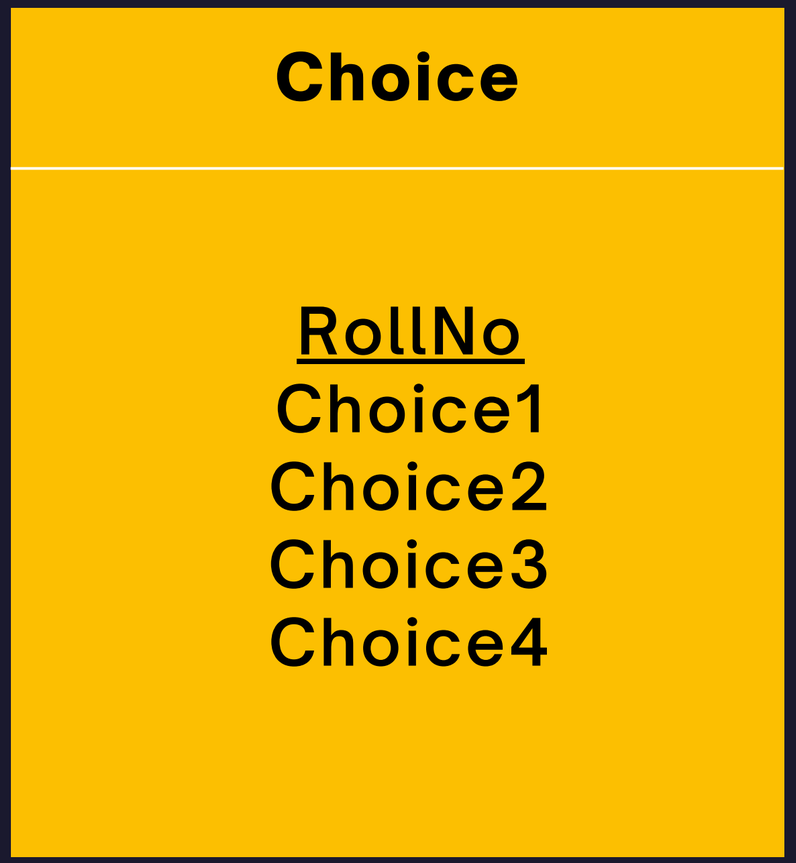
Functional Dependencies:

RollNo. --> Name, DOB, Address, Password, Payment_ID, Amount, Category.

Payment_ID --> Amount

Amount --> Category

Schemas After Decomposition of ER Diagram



Functional Dependencies:

RollNo. --> Choice1, Choice2, Choice3, Choice4

Schemas After Decomposition of ER Diagram

Result
CRL_Rank RollNo. Percentile1 Paercentil2

Functional Dependencies:

CRL_Rank --> RollNo., Percentile1, Percentile2

RollNo. --> Percentile1, Percentile2

Schemas After Decomposition of ER Diagram

Institute
Insti_Name CourseName Website_link city state No_of_seats

Functional Dependencies:

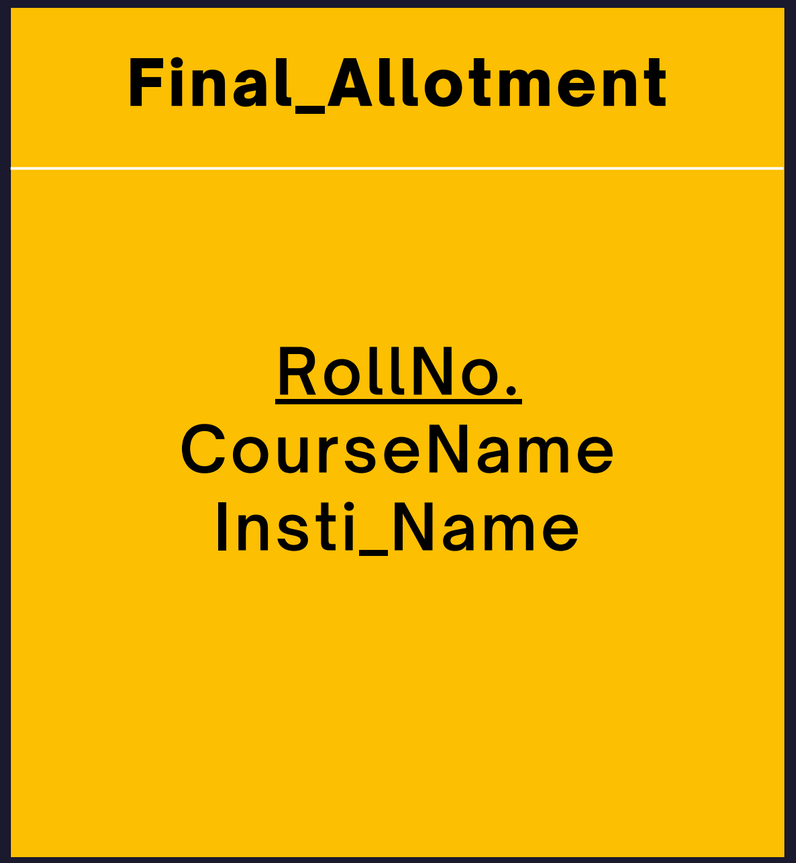
Insti_Name, CourseName --> Website_link, city, state, No_of_seats.

Insti_Name --> city

city --> state

Insti_Name --> Website_link

Schemas After Decomposition of ER Diagram



Functional Dependencies:

RollNo. --> CourseName, Insti_Name

Schemas After Decomposition of ER Diagram

Cutoff
Insti_Name CourseName Round1 Round2 Round3 Round4

Functional Dependencies:

Insti_Name, CourseName --> Round1, Round2, Round3, Round4.

Normalisation

Institute
Insti_Name CourseName Website_link city state No_of_seats

- Institute schema is already in 1NF because by default all attributes are atomic.
- Institute schema is not in 2NF due to partial dependencies of-

  Insti_Name ⟶ city

  Insti_Name ⟶ Website_link

So, to remove partial dependency we need to decompose Institute schema.

Decomposing Institute Schema

FD'S of College

Insti_Name → Website_link, city, state

city → state

FD'S of Course

Insti_Name, CourseName → No_of_Seats

- Now, Course is in 3NF but not College due to transitive dependency of-

  Insti_Name → city

  city → state

- So, to remove transitive dependency we need to decompose College schema.

Decomposing College Schema

FD'S of College_Info
Insti_Name → Website_link, city

FD'S of Location
city → state

Finally, all the schemas- **Course**, **College_Info** and **Location** are in *BCNF* because there are candidate keys only on lefthand side of their FDs

Registration
RollNo
Name
DOB
Address
Password
PaymentID
Amount
Category

- Registration schema is already in 1NF because by default all attributes are atomic.
- Registration schema is already in 2NF
- Registration schema is not in 3NF due to transitive dependency of-

  PaymentID $\longrightarrow$ Amount

  Amount $\longrightarrow$ Category

So, in order to remove transitive dependency we need to decompose Registration schema

Decomposing Registration Schema

Student_Info

RollNo
Name
DOB
Address
Password
PaymentID
Category

Payment_Info

PaymentID
Amount

FD'S of Student_Info

RollNo → Name, DOB, Address, Password, PaymentID, Category

FD's of Payment_Info

PaymentID → Amount

- Student_Info and Payment_Info schemas are in 3NF because there doesn't exist any transitive dependency
- Student_Info and Payment_Info both are in BCNF due to presence of candidate keys only on lefthand side of their FDs.

Choice

RollNo
Choice1
Choice2
Choice3
Choice4

- Choice schem is already in 1NF
- Choice schema is already in 2NF
- Choice schema is already in 3NF
- Choice schema is already in BCNF

Result

CRL_Rank
RollNo
Percentile1
Percentile2

- Result schema is already in 1NF
- Result schema is already in 2NF
- Result schema is already in 3NF
- Result schema is already in BCNF

Cutoff
Insti_Name *CourseName* *Round1* *Round2* *Round3* *Round4*

- Cutoff schema is already in 1NF
- Cutoff schema is already in 2NF
- Cutoff schema is already in 3NF
- Cutoff schema is already in BCNF

Final_Allotment

RollNo
Insti_Name
CourseName

- Final_Allotment schema is already in 1NF
- Final_Allotment schema is already in 2NF
- Final_Allotment schema is already in 3NF
- Final_Allotment schema is already in BCNF

FINAL SCHEMAS

Finally, we are left with 9 schemas, after normalising each one till BCNF

Choice

RollNo	Choice1	choice2	choice3	Choice4
103	CSE(IIT Delhi)	EE (IIT Delhi)	AI & DS (IIT Jodhpur)	ME (IIT Delhi)
107	AI & DS(IIT Jodhpur)	AE (IIT Kanpur)	CHE (IIT Kanpur)	CSE (NIT Calicut)
109	CHE(IIT Kanpur)	AE (IIT Kanpur)	AI & DS (IIT Jodhpur)	CE (IIT Jodhpur)
132	CSE (NIT Calicut)	AI & DS (IIT Jodhpur)	CSE (IIIT Sonipat)	EE (IIIT Sonipat)
138	AI & DS(IIT Jodhpur)	CHE (IIT Kanpur)	AE (IIT Kanpur)	CE (IIT Jodhpur)
143	CE (NIT Jaipur)	MAE (NIT Jaipur)	CSE (IIITM Gwalior)	IT+ MBA (IIITM Gwalior)
145	EE(IIT Delhi)	ME (IIT Delhi)	CHE (IIT Kanpur)	AE (IIT Kanpur)
146	AI & DS (IIT Jaipur)	CSE (NIT Calicut)	CSE (IIIT Sonipat)	EE (IIIT Sonipat)
171	CSE(IIT Delhi)	AI & DS (IIT Jodhpur)	EE (IIT Delhi)	CHE (IIT Kanpur)
178	CE (IIT Jodhpur)	EE (NIT Calicut)	CSE (NIT Calicut)	MAE (NIT Jaipur)
195	CSE (IIITM Gwalior)	CSE (IIIT Sonepat)	IT + MBA (IIITM Gwalior)	EE (IIIT Sonepat)
241	CSE (IIITM Gwalior)	IT + MBA (IIITM Gwalior)	CSE (IIIT Sonepat)	EE (IIIT Sonepat)
741	CSE (IIITM Gwalior)	IT + MBA (IIITM Gwalior)	CSE (IIIT Sonipat)	EE (IIIT Sonipat)
985	CSE(IIT Delhi)	EE (IIT Delhi)	ME (IIT Delhi)	CHE (IIT Kanpur)
986	MAE (NIT Jaipur)	CE (NIT Jaipur)	CSE (IIITM Gwalior)	IT+ MBA (IIITM Gwalior)

Payment_Info

PaymentID	Amount
AD1678	25000
AQ1473	65000
AW1479	80000
CV9300	17000
GF1245	17000
NC7312	80000
OL1112	17000
PL3000	80000
QP3322	65000
QZ4690	65000
QZ7300	25000
SV7842	65000
TC7408	80000
TY9632	80000
ZA1426	80000

College_Info

Insti_Name	City	Website_Link
IIIT Kanpur	Kanpur	https://www.iitk.ac.in
IIIT Sonepat	Sonepat	https://www.iitsonepat.ac.in
IIITM Gwalior	Gwalior	https://www.iiitm.ac.in
IIT Delhi	Delhi	https://home.iitd.ac.in
NIT Calicut	Calicut	https://www.nitc.ac.in
NIT Jaipur	Jaipur	https://www.mnit.ac.in
NIT Jodhpur	Jodhpur	https://www.iitj.ac.in

Course

Insti_Name	CourseName	No_of_seats
IIIT Sonipat	CSE	120
IIIT Sonipat	IT	60
IIITM Gwalior	CSE	81
IIITM Gwalior	IT + MBA	69
IIT Delhi	CSE	99
IIT Delhi	EE	120
IIT Delhi	ME	95
IIT Jodhpur	AI & DS	55
IIT Jodhpur	CE	40
IIT Kanpur	AE	55
IIT Kanpur	CHE	83
NIT Calicut	CSE	72
NIT Calicut	EE	69
NIT Jaipur	CE	65
NIT Jaipur	MAE	46

Student_Info

RollNo	Name	Password	DOB	Address	PaymentID	Category
103	Rajesh	14785	2001-07-12	Ram Nagar,Gwalior	AD1678	SC
107	Vikram	12347	2004-08-14	Deen Dayal Colony,Bombay	GF1245	ST
109	Shivam	32517	2001-02-11	Adarsh Nagar,Bhopal	QZ4690	OBC-NCL
132	Om	65484	2006-07-18	Sagar Landamrk,Amritsar	QP3322	GEN-EWS
138	Vikram	10047	2002-09-14	Ring City Colony,Chennai	ZA1426	GEN
143	Vikram	96523	2005-11-02	Sadar Bazaar,Bathinda	NC7312	GEN
145	Vishal	14702	2002-06-14	Maya Vihar,Pune	AW1479	GEN
146	Lives	16932	2001-07-12	Kunj Vihar,Jhansi	TY9632	GEN
171	Abhishek	98703	2005-04-16	Vidhyanchal Valley ,Jammu	QZ7300	SC
178	Aradhya	98652	2005-03-24	Vikas Nagar,Kolkata	AQ1473	GEN-EWS
195	Aryan	75558	2004-03-11	Shivaji Nagar, Chandigarh	PL3000	GEN
241	Puneet	34125	2001-02-11	Ujjal Vihar,Bathinda	SV7842	OBC-NCL
741	Aradhya	14728	2004-07-05	Sood Colony,Gwalior	TC7408	GEN
985	Ravi	75432	2002-03-06	Wine Woods Colony,Pune	CV9300	ST
986	Ravi	74102	2004-07-16	Vardhaman Park, Indore	OL1112	ST

Result

RollNo	CRL_Rank	Percentile1	Percentile2
985	9	99.99	99.21
103	37	99.8	99.23
171	69	99.22	98.9
109	436	99.18	98.98
145	499	97.6	99.15
138	567	98.3	99.12
107	842	99.04	97.38
178	1113	98.99	96.46
986	3286	98.94	98.96
143	3301	98.92	98.81
241	4452	98.87	96.22
195	4490	98.78	92.47
741	5621	95.32	98.76
146	6673	99.69	91.48
132	8831	97.69	96.14

Cutoff

sti_Name	CourseName	Round1	Round2	Round3	Round4
IT Sonipat	CSE	7719	7987	8144	8325
IT Sonipat	EE	9207	9516	9767	9922
ITM Gwalior	CSE	5799	5917	6073	6159
ITM Gwalior	IT + MBA	6509	6739	6921	7112
T Delhi	CSE	72	86	92	101
T Delhi	EE	104	115	121	135
T Delhi	ME	187	194	202	215
T Jodhpur	AI & DS	820	867	927	962
T Jodhpur	CE	1182	1278	1340	1456
T Kanpur	AE	690	720	759	786
T Kanpur	CHE	489	510	567	610
T Calicut	CSE	1940	2090	2134	2289
T Calicut	EE	2656	2798	2955	3109
T Jaipur	CE	4332	4589	4877	5013
T Jaipur	MAE	3318	3577	3720	3923

Final_Allotment

RollNo	Insti_Name	CourseName
985	IIT Delhi	CSE
103	IIT Delhi	CSE
171	IIT Delhi	EE
109	IIT Kanpur	CHE
145	IIT Kanpur	AE
138	IIT Jodhpur	AI & DS
107	NIT Calicut	CSE
178	NIT Calicut	EE
966	NIT Jaipur	MAE
143	NIT Jaipur	CE
241	IIITM Gwalior	CSE
741	IIITM Gwalior	IT + MBA
146	IIIT Sonepat	CSE
132	IIIT Sonepat	EE

Location

City	State
Calicut	Kerala
Delhi	Delhi
Gwalior	Madhya Pradesh
Jaipur	Rajasthan
Jodhpur	Rajasthan
Kanpur	Uttar Pradesh
Sonepat	Harayana

SQL Query 1

Query Statement

Name and RollNo of all the students selected in AI & DS , IIT Jodhpur .

SQL Query

```
select Name,RollNo
 from Student_Info
where RollNo in(select RollNo
                from Final_Allotment
                where Insti_Name = 'IIT Jodhpur ' and
CourseName = ‘AI & DS ');
```

Explanation

Here first roll no with insti_name IIT Jodhpur and course name AI & DS was selected from final allotment schema and then those roll no along with their names was displayed

Output

```
+---------+---------+
| Name    | RollNo  |
+---------+---------+
| Vikram  |     138 |
+---------+---------+
1 row in set (0.01 sec)
```

SQL Query 2

Query Statement

Name and RollNo of all the students who were finally alloted the electrical engineering branch

SQL Query

```
select Name , RollNo
from Student_Info
where RollNo in (select RollNo
                 from Final_Allotment
                 where CourseName = 'EE') ;
```

Explanation

Here the name and roll no of those students from student_info schema were displayed whose course name was EE in the in the final_Allotment schema

Output

Name	RollNo
Abhishek	171
Aradhya	178
Om	132

SQL Query 3

Query Statement

Print the average number of seats in each institute

SQL Statement

```
select Insti_Name , avg(No_Of_Seats) as Avg_Seats
from Course
group by Insti_Name;
```

Explanation

Here all the courses of each institute were grouped by institute name and then the average seats of all the courses offered in that institute were displayed along with their names.

Output

Insti_Name	Avg_Seats
IIIT Sonipat	90.0000
IIITM Gwalior	75.0000
IIT Delhi	104.6667
IIT Jodhpur	47.5000
IIT Kanpur	69.0000
NIT Calicut	70.5000
NIT Jaipur	55.5000

SQL Query 4

Query Statement

Show the different institutes in each state .

SQL Query

```
select Insti_Name , City , State
 from College_Info natural join Location
 order by State ;
```

Explanation

Here college_info and location schemas were naturally joined and then ordered by state. Then the name, state and city of those institutes were displayed

Output

Insti_Name	City	State
IIT Delhi	Delhi	Delhi
IIIT Sonepat	Sonepat	Harayana
NIT Calicut	Calicut	Kerala
IIITM Gwalior	Gwalior	Madhya Pradesh
NIT Jaipur	Jaipur	Rajasthan
NIT Jodhpur	Jodhpur	Rajasthan
IIIT Kanpur	Kanpur	Uttar Pradesh

SQL Query 5

Query Statement

Show the name and website links of Institute that offers more than 2 courses

SQL Query

```
select Insti_Name, Website_Link
from College_Info
where Insti_Name in(select Insti_Name
                    from Course
                    group by Insti_Name
                    having count(CourseName)> 2);
```

Explanation

Here the institutes which offer more than two courses were selected from the course schema, grouped by the insti_name and then the name and website link of those institutes were displayed from the college_info schema

Output

Insti_Name	Website_Link
IIT Delhi	https://home.iitd.ac.in

RELAX QUERY 1

Query Statement

Show the CRL rank and Name of the students who belong to SC or ST category

$$\pi_{\text{CRL\_Rank, Name}} (\sigma_{\text{Category = 'SC' or Category = 'ST'}} (\text{Student\_Info} \bowtie \text{Result}))$$

Execution time: 7 ms

OUTPUT

Result.CRL_Rank	Student_Info.Name
37	'Rajesh'
842	'Vikram'
69	'Abhishek'
9	'Ravi'
3286	'Ravi'

RELAX QUERY 2

Query Statement

Show the name and Roll no. of the students who paid amount more than 25000.

$$\pi_{\text{RollNo, Name}} (\sigma_{\text{Amount} > 25000} (\text{Student\_Info} \bowtie \text{Payment\_Info}))$$

Execution time: 0 ms

OUTPUT

Student_Info.RollNo	Student_Info.Name
109	'Shivam'
132	'Om'
138	'Vikram'
143	'Vikram'
145	'Vishal'
146	'Lives'
178	'Aradhya'
195	'Aryan'
241	'Puneet'
741	'Aradhya'

RELAX QUERY 3

Query Statement

Show the name and roll no of students students who improved their performance in 2nd attempt of jee

$$\pi_{\text{RollNo, Name}} (\sigma_{\text{Percentile2} > \text{Percentile1}} (\text{Student\_Info} \bowtie \text{Result}))$$

Execution time: 4 ms

OUTPUT

Student_Info.RollNo	Student_Info.Name
138	'Vikram'
145	'Vishal'
741	'Aradhya'
986	'Ravi'

RELAX QUERY 4

Query Statement

Name and address of students who scored more than 1000.

$$\pi_{\text{Name, Address}} (\sigma_{\text{CRL\_Rank} > 1000} (\text{Student\_Info} \bowtie \text{Result}))$$

Execution time: 15 ms

OUTPUT

Student_Info.Name	Student_Info.Address
'Om'	'Sagar Landmark, Amritsar'
'Vikram'	'Sadar Bazaar, Bathinda'
'Lives'	'Kunj Vihar, Jhansi'
'Aradhya'	'Vikas Nagar, Kolkata'
'Aryan'	'Shivaji Nagar, Chandigarh'
'Puneet'	'Ujjal Vihar, Bathinda'
'Aradhya'	'Sood Colony, Gwalior'
'Ravi'	'Vardhaman Park, Indore'

RELAX QUERY 5

Query Statement

Show the name and CRL rank of the students whose percentile decreased by more than 2.

$$\pi_{\text{Name, CRL\_Rank}} \left(\sigma_{\text{Percentile1 - Percentile2} > 2} \left(\text{Student\_Info} \bowtie \text{Result} \right) \right)$$

Execution time: 2 ms

OUTPUT

Student_Info.Name	Result.CRL_Rank
'Lives'	6673
'Aradhya'	1113
'Aryan'	4490
'Puneet'	4452

THANK YOU