Submitted To :

Dr. Abu Raihan Mostofa Kamal
Professor, CSE Department
Islamic University of Technology

Zannatun Naim Sristy
Lecturer, CSE Department
Islamic University of Technology

Submitted By :

Sian Ashsad
ID   : 200042151
Prog. : BSc in SWE
Dept. : CSE

Report :

Working code :

1) Code for creating the graph with necessary nodes and relations with properties.

```
-->1<--
CREATE (:Customer {c_id: 1, name: 'Dihan', phone_no: '018243245234', age:
22, gender: 'M'})
CREATE (:Customer {c_id: 2, name: 'Nafisa', phone_no: '015523434534', age:
21, gender: 'F'})
CREATE (:Customer {c_id: 3, name: 'Naz', phone_no: '01567889344', age: 22,
gender: 'M'})
CREATE (:Customer {c_id: 7, name: 'N', phone_no: '99032432523', age: 32,
gender: 'M'})

CREATE (:Genre {name: 'Action'})
CREATE (:Genre {name: 'Thriller'})
CREATE (:Genre {name: 'Romance'})

CREATE (:Author {name: 'Stephenie Meyer', country: 'USA', date_of_birth:
'5-10-1982'})
CREATE (:Author {name: 'Aron Blake', country: 'USA', date_of_birth:
'12-10-1963'})
CREATE (:Author {name: 'Sian Ashsad', country: 'AFR', date_of_birth:
'7-31-2001'})

CREATE (:Book {title: 'Twilight', published: 1998, price: 20.00})
CREATE (:Book {title: 'Twilight : New Moon', published: 2000, price:
25.00})
CREATE (:Book {title: 'Twilight : Eclipse', published: 2001, price:
26.00})
CREATE (:Book {title: 'Twilight : Breaking Dawn Part I', published: 2002,
price: 30.00})
CREATE (:Book {title: 'Twilight : Breaking Dawn Part II', published: 2003,
price: 30.00})
CREATE (:Book {title: 'Twilight : Eclipse', published: 2001, price:
26.00})
CREATE (:Book {title: 'The Wolf of Wall Street', published: 1978,price:
17.00})
CREATE (:Book {title: 'Iron Shell', published: 2020, price: 5.00})
```

```
MATCH (c:Customer),(g:Genre),(a:Author),(b:Book)
WHERE c.c_id = 1 AND g.name = 'Romance' AND a.name = 'Stephenie Meyer' AND
b.title = 'Twilight'
CREATE (c)-[:PURCHASED {purchasing_date: '2023-04-04', amount:
20.00}]->(b)
CREATE (c)-[:RATED {rating: 4}]->(a)
CREATE (c)-[:RATING {rating: 5}]->(b)
CREATE (b)-[:BELONGS_TO]->(g)
CREATE (b)-[:WRITTEN_BY]->(a)

MATCH (g:Genre),(a:Author),(b:Book)
WHERE g.name = 'Romance' AND a.name = 'Stephenie Meyer' AND b.title =
'Twilight : New Moon'
CREATE (b)-[:BELONGS_TO]->(g)
CREATE (b)-[:WRITTEN_BY]->(a)

MATCH (g:Genre),(a:Author),(b:Book)
WHERE g.name = 'Romance' AND a.name = 'Stephenie Meyer' AND b.title =
'Twilight : Breaking Dawn Part I'
CREATE (b)-[:BELONGS_TO]->(g)
CREATE (b)-[:WRITTEN_BY]->(a)

MATCH (g:Genre),(a:Author),(b:Book)
WHERE g.name = 'Romance' AND a.name = 'Stephenie Meyer' AND b.title =
'Twilight : Breaking Dawn Part II'
CREATE (b)-[:BELONGS_TO]->(g)
CREATE (b)-[:WRITTEN_BY]->(a)

MATCH (g:Genre),(a:Author),(b:Book)
WHERE g.name = 'Thriller' AND a.name = 'Aron Blake' AND b.title = 'The
Wolf of Wall Street'
CREATE (b)-[:BELONGS_TO]->(g)
CREATE (b)-[:WRITTEN_BY]->(a)

MATCH (g:Genre),(a:Author),(b:Book)
WHERE g.name = 'Thriller' AND a.name = 'Sian Ashsad' AND b.title = 'Iron
Shell'
CREATE (b)-[:BELONGS_TO]->(g)
CREATE (b)-[:WRITTEN_BY]->(a)
```

```cypher
MATCH (g:Genre),(b:Book)
WHERE g.name = 'Thriller' AND b.title = 'Twilight : New Moon'
CREATE (b)-[:BELONGS_TO]->(g)



MATCH (g:Genre),(b:Book)
WHERE g.name = 'Action' AND b.title = 'The Wolf of Wall Street'
CREATE (b)-[:BELONGS_TO]->(g)



MATCH (g:Genre),(b:Book)
WHERE g.name = 'Thriller' AND b.title = 'Twilight : Breaking Dawn Part I'
CREATE (b)-[:BELONGS_TO]->(g)



MATCH (g:Genre),(b:Book)
WHERE g.name = 'Thriller' AND b.title = 'Twilight : Breaking Dawn Part II'
CREATE (b)-[:BELONGS_TO]->(g)



MATCH (b1:Book), (b2:Book)
WHERE b1.title = 'Twilight' AND b2.title = 'Twilight : New Moon'
CREATE (b2)-[:VOLUME_OF]->(b1)

MATCH (b1:Book), (b2:Book)
WHERE b1.title = 'Twilight' AND b2.title = 'Twilight : Eclipse'
CREATE (b2)-[:VOLUME_OF]->(b1)

MATCH (b1:Book), (b2:Book)
WHERE b1.title = 'Twilight' AND b2.title = 'Twilight : Breaking Dawn Part
I'
CREATE (b2)-[:VOLUME_OF]->(b1)

MATCH (b1:Book), (b2:Book)
WHERE b1.title = 'Twilight' AND b2.title = 'Twilight : Breaking Dawn Part
II'
CREATE (b2)-[:VOLUME_OF]->(b1)


MATCH (c:Customer), (b:Book)
```

```
WHERE c.c_id = 1 AND b.title = 'Twilight : New Moon'
CREATE (c)-[:PURCHASED {purchasing_date: '2023-04-02', amount:
20.00}]->(b)
CREATE (c)-[:RATING {rating: 5}]->(b)


MATCH (c:Customer), (b:Book) , (a: Author)
WHERE c.c_id = 2 AND b.title = 'Twilight : Eclipse' AND a.name =
'Stephenie Meyer'
CREATE (c)-[:PURCHASED {purchasing_date: '2023-04-04', amount:
25.00}]->(b)
CREATE (c)-[:RATED {rating: 3}]->(a)
CREATE (c)-[:RATING {rating: 3}]->(b)


MATCH (c:Customer), (b:Book) , (a: Author)
WHERE c.c_id = 3 AND b.title = 'Twilight : Breaking Dawn Part I' AND
a.name = 'Stephenie Meyer'
CREATE (c)-[:PURCHASED {purchasing_date: '2023-03-04', amount:
30.00}]->(b)
CREATE (c)-[:RATED {rating: 4}]->(a)
CREATE (c)-[:RATING {rating: 4}]->(b)


MATCH (c:Customer), (b:Book), (a: Author)
WHERE c.c_id = 7 AND b.title = 'Twilight : Breaking Dawn Part II' AND
a.name = 'Stephenie Meyer'
CREATE (c)-[:PURCHASED {purchasing_date: '2023-02-04', amount:
30.00}]->(b)
CREATE (c)-[:RATED {rating: 4}]->(a)
CREATE (c)-[:RATING {rating: 3}]->(b)


MATCH (c:Customer), (b:Book), (a: Author)
WHERE c.c_id = 7 AND b.title = 'Iron Shell' AND a.name = 'Sian Ashsad'
CREATE (c)-[:PURCHASED {purchasing_date: '2023-01-04', amount:
30.00}]->(b)
CREATE (c)-[:RATED {rating: 4}]->(a)
CREATE (c)-[:RATING {rating: 3}]->(b)


MATCH (c:Customer), (b:Book), (a: Author)
WHERE c.c_id = 7 AND b.title = 'The Wolf of Wall Street' AND a.name =
'Aron Blake'
```
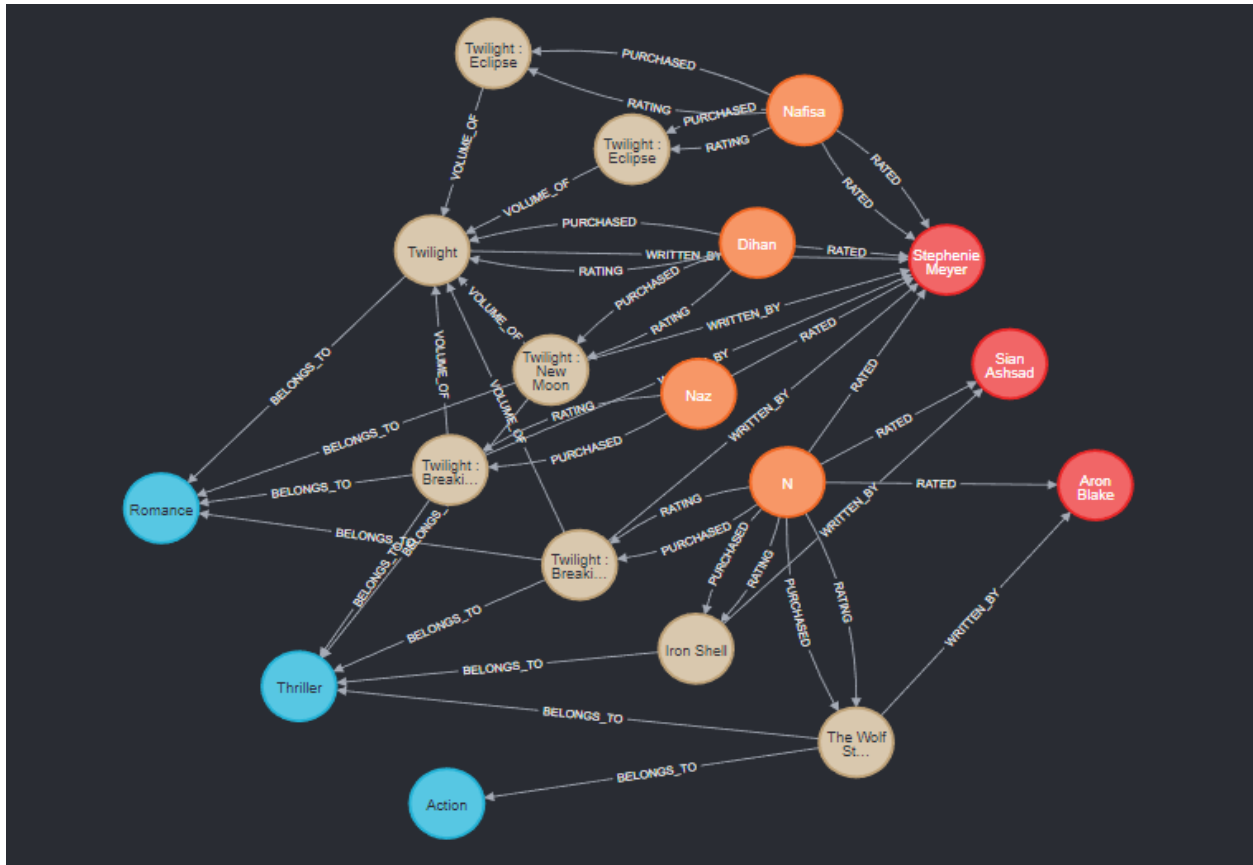
```
CREATE (c)-[:PURCHASED {purchasing_date: '2023-02-14', amount:
15.00}]->(b)
CREATE (c)-[:RATED {rating: 7}]->(a)
CREATE (c)-[:RATING {rating: 3}]->(b)
```

Full Graph :

2) Cypher Queries :
a)
```
--a
MATCH (c:Customer)-[p:PURCHASED]->(b:Book)
RETURN b.title, SUM(p.amount) AS revenue
ORDER BY revenue DESC
```

b.title	revenue
"Twilight : Eclipse"	50.0
"Twilight : Breaking Dawn Part I"	30.0
"Twilight : Breaking Dawn Part II"	30.0
"Iron Shell"	30.0
"Twilight"	20.0
"Twilight : New Moon"	20.0

b)

```
MATCH (c:Customer)-[r:RATING]->(b:Book)-[:BELONGS_TO]->(g:Genre)
RETURN g.name, AVG(r.rating) AS avg_rating
ORDER BY avg_rating DESC
```

g.name	avg_rating
"Romance"	4.25
"Thriller"	3.6
"Action"	3.0

c)

```
MATCH (c:Customer {name: 'N'})-[:PURCHASED]->(b:Book)
WHERE b.purchasing_date >= '2023-01-01' AND b.purchasing_date <=
'2023-04-09'
RETURN b.title
ORDER BY b.purchasing_date DESC
```

b.title
"Twilight"
"Twilight : New Moon"
"Twilight : Eclipse"

d)

```
MATCH (c:Customer)-[:PURCHASED]->(b:Book)
WITH c, count(b) AS num_books
RETURN c.name
ORDER BY num_books DESC
```

```
LIMIT 1
```

c.name
"N"

e)
```
MATCH (b:Book)<-[:PURCHASED]-(c:Customer)
RETURN b.title, COUNT(c) AS purchases
ORDER BY purchases DESC
```

b.title	purchases
"Twilight : Eclipse"	2
"Twilight"	1
"Twilight : New Moon"	1
"Twilight : Breaking Dawn Part I"	1
"Twilight : Breaking Dawn Part II"	1
"The Wolf of Wall Street"	1

f)
```
MATCH (c:Customer)-[pr : PURCHASED|RATING]->(b:Book)
WHERE b.title = 'Twilight : New Moon'
RETURN c.name, pr.rating, pr.purchasing_date
```

c.name	pr.rating
"Dihan"	5

g)
```
MATCH (c:Customer)-[:PURCHASED]->(b:Book)-[:WRITTEN_BY]->(a:Author)
WHERE a.name = 'Stephenie Meyer'
RETURN DISTINCT c.name
```

	c.name
1	"N"
2	"Naz"
3	"Dihan"

h)

```
CALL algo.apriori(
  'MATCH (c:Customer)-[:PURCHASED]->(b:Book) RETURN c.c_id as customer,
collect(b.title) as books',
  'WITH minSupport=0.01, minConfidence=0.5
   RETURN *
   ORDER BY support DESC',
  {graph: 'cypher', write:true, writeProperty:'rules'}
)
```

"Twilight : Breaking Dawn Part I"
"Twilight : Breaking Dawn Part II"