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Q1:

A: The relationship in this graph includes ASSOCIATED, WATCHED, POSTED, THUMBSUP, POSTOF, and GRADUATED.

B: LOOKUP and BTREE indexes are already built.

C: The labels in the graph include Student, Instructor, Course, Meeting, Recording, Post, and Degree.

Q2:

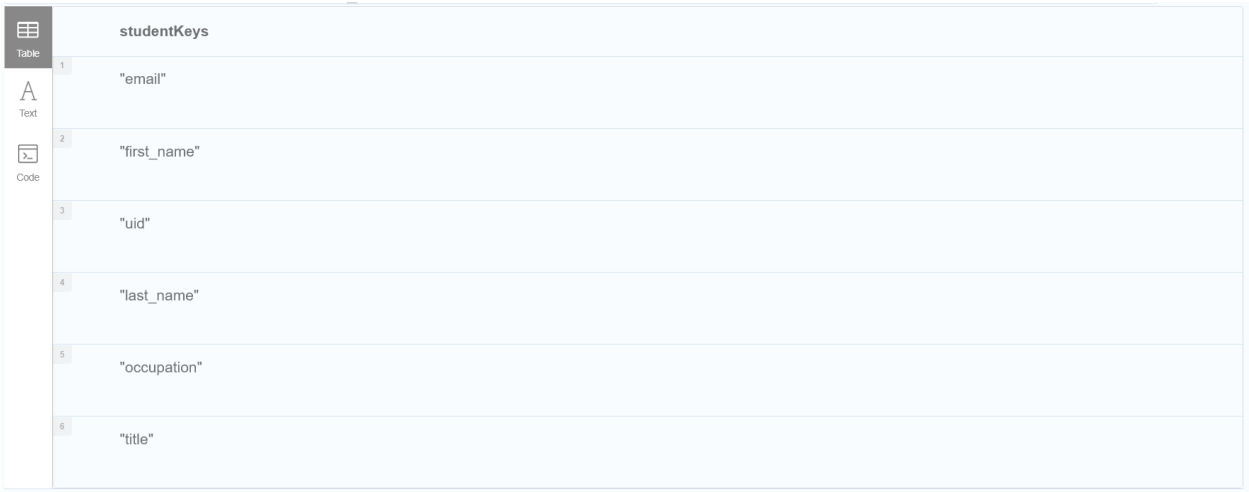
A Meeting has an ATTENDED relationship pointed to it from a Student and an ASSOCIATED relationship pointed toward it from a RECORDING.

Q3:

Query:

```
MATCH (s: Student)
WITH s LIMIT 1000
UNWIND (keys(s)) AS studentKeys
RETURN DISTINCT studentKeys
```

Results (screenshot below):

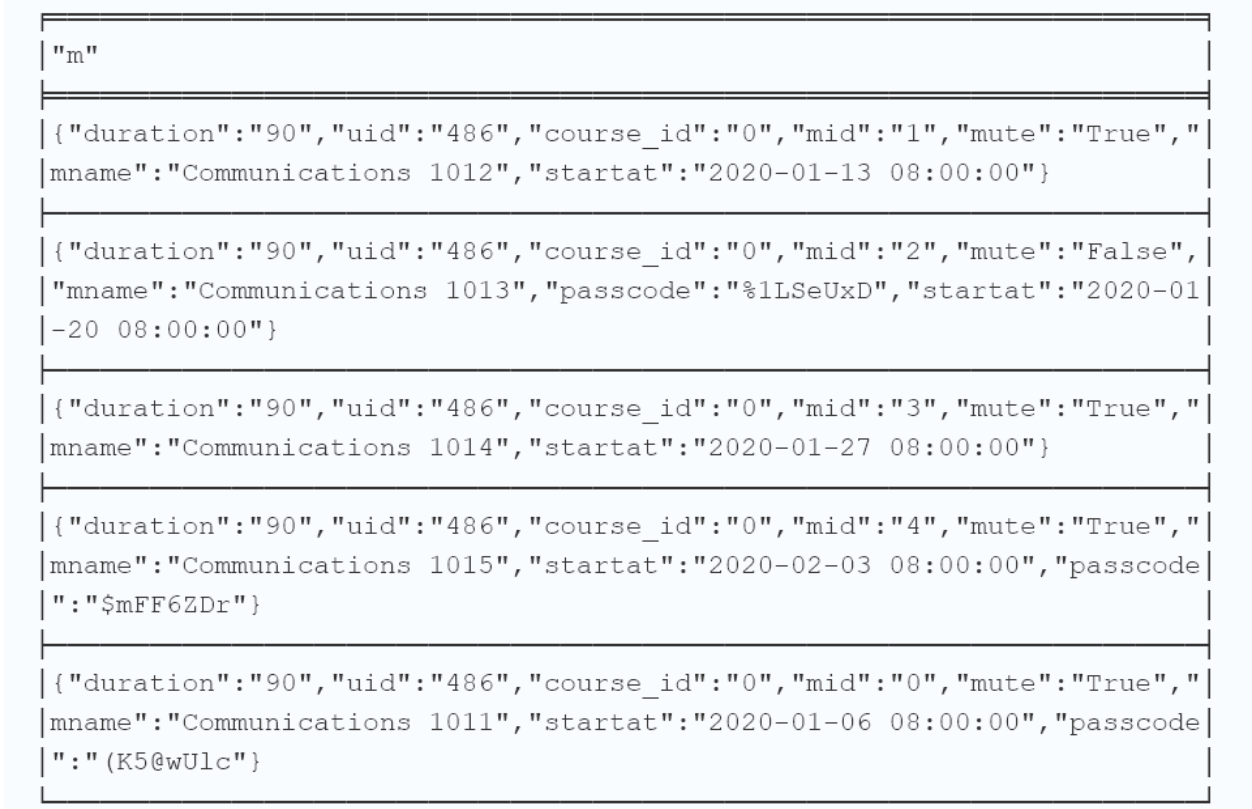


Q4 A:

Query:

```
1  MATCH (m: Meeting)
2  RETURN m
3  ORDER BY m.duration DESC
4  LIMIT 5;
```

Results (screenshot below):



```
"m"
{"duration":"90","uid":"486","course_id":"0","mid":"1","mute":"True","mname":"Communications 1012","startat":"2020-01-13 08:00:00"}
{"duration":"90","uid":"486","course_id":"0","mid":"2","mute":"False","mname":"Communications 1013","passcode":"%1LSeUxD","startat":"2020-01-20 08:00:00"}
{"duration":"90","uid":"486","course_id":"0","mid":"3","mute":"True","mname":"Communications 1014","startat":"2020-01-27 08:00:00"}
{"duration":"90","uid":"486","course_id":"0","mid":"4","mute":"True","mname":"Communications 1015","startat":"2020-02-03 08:00:00","passcode":"$mFF6ZDr"}
{"duration":"90","uid":"486","course_id":"0","mid":"0","mute":"True","mname":"Communications 1011","startat":"2020-01-06 08:00:00","passcode":"(K5@wUlc"}
```

Q4 B:

Query:

```
MATCH (a) -[:ATTENDED]→ (m: Meeting)
WHERE m.mid = "101"
RETURN a, m
LIMIT 5;
```

Results (screenshot below):

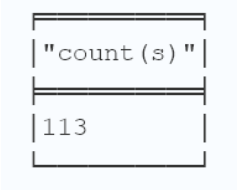
"a"	"m"
{"uid":"324","last_name":"Brown","first_name":"Paula","email":"foleygeorge@washington state.edu"}	{"duration":"30","uid":"142","course_id":"5","mid":"101","mute":"True","mname":"Advanced Math3","startat":"2020-10-21 13:00:00"}
{"uid":"177","last_name":"Bowman","first_name":"Ryan","email":"thomas63@washington state.edu"}	{"duration":"30","uid":"142","course_id":"5","mid":"101","mute":"True","mname":"Advanced Math3","startat":"2020-10-21 13:00:00"}
{"uid":"38","last_name":"Charles","first_name":"Valerie","email":"carlosramirez@mit.edu"}	{"duration":"30","uid":"142","course_id":"5","mid":"101","mute":"True","mname":"Advanced Math3","startat":"2020-10-21 13:00:00"}
{"uid":"90","occupation":"Hotel manager","last_name":"Lawson","first_name":"Brian","email":"drakefrederick@uci.edu"}	{"duration":"30","uid":"142","course_id":"5","mid":"101","mute":"True","mname":"Advanced Math3","startat":"2020-10-21 13:00:00"}
{"uid":"292","last_name":"Cowan","first_name":"Brian","email":"warrenkenneth@ucla.edu"}	{"duration":"30","uid":"142","course_id":"5","mid":"101","mute":"True","mname":"Advanced Math3","startat":"2020-10-21 13:00:00"}

Q4 C:

Query:

```
1 MATCH (s: Student)
2 WHERE NOT exists((s) -[:POSTED]→ (:Post))
3 RETURN count(s);
```

Results (screenshot below):



```
╒═══════════╕
│"count(s)"│
╞═══════════╡
│113        │
└───────────┘
```

Q4 D:

Query:

```
MATCH (s: Student) -[:WATCHED]→ (r: Recording) -[:ASSOCIATED]→ (m: Meeting)
WHERE m.mname = "Creative Writing14"
RETURN DISTINCT s.first_name, s.last_name
ORDER BY s.first_name;
```

Results (screenshot below):

"s.first_name"	"s.last_name"
"Brian"	"Lawson"
"Christine"	"Lopez"
"Cindy"	"Rice"
"Danielle"	"Jackson"
"Jeffrey"	"Burns"
"Maria"	"Ramirez"
"Ryan"	"Reid"

Q4 E:

Query:

```
MATCH (s: Student) -[:ENROLLED_IN]→ (c: Course)
WITH c, count(s) AS studentCount
WHERE studentCount < 10
RETURN c.course_id, c.course_name, studentCount
ORDER BY studentCount DESC;
```

Results (screenshot below):

"c.course_id"	"c.course_name"	"studentCount"
"26"	"Religion II"	9
"32"	"Humanities 102"	9
"55"	"Algebra II"	9
"71"	"Civilization"	9
"83"	"Humanities 101"	9
"7"	"Physics 101"	8
"54"	"Medicine"	7
"85"	"Photography"	7
"62"	"Beyond Database Systems"	6

Q4 F:

Query:

```
MATCH (s: Student) -[:POSTED]→ (p: Post) -[:POSTOF]→ (m: Meeting)
WITH s, count(p) AS postCount, collect(m.mid) AS studentMeetings
WHERE postCount > 10
UNWIND studentMeetings AS activeMeetings
RETURN activeMeetings
ORDER BY toInteger(activeMeetings)
LIMIT 5;
```

Results (screenshot below):

"activeMeetings"
"83"
"121"
"129"
"129"
"191"

Q4 G:

Query:

```
MATCH (s1: Student) -[t1:THUMBSUP]→ (p: Post) ←[t2:THUMBSUP]- (s2: Student)
WHERE s1.uid <> s2.uid AND id(s1) > id(s2)
RETURN s1.first_name, s2.first_name, p.pid
ORDER BY p.pid
LIMIT 10;
```

Results (screenshot below):

"s1.first_name"	"s2.first_name"	"p.pid"
"Ronald"	"Rebecca"	"0"
"William"	"Randy"	"101"
"Paula"	"Randy"	"101"
"William"	"Christina"	"101"
"Randy"	"Christina"	"101"
"Paula"	"Christina"	"101"
"Paula"	"William"	"101"
"Kyle"	"Karen"	"25"
"Steven"	"Rebecca"	"33"
"Justin"	"Rebecca"	"33"

Q4 H:

Query:

```
1 MATCH (i: Instructor) -[:TEACHES]→ (c: Course) ←[:ENROLLED_IN]- (s:Student)
2 WHERE exists((s) -[:TEACHES]→ (:Course) ←[:ENROLLED_IN]- (i))  AND id(s) > id(i)
3 RETURN i.first_name, i.last_name, s.first_name, s.last_name;
```

Results (screenshot below):

"i.first_name"	"i.last_name"	"s.first_name"	"s.last_name"
"Patricia"	"Moreno"	"Mr."	"Charles"
"Charles"	"Shields"	"Mr."	"Charles"

Q4 I:

Query:

```
1 MATCH (s: Student), (i: Instructor), (c: Course)
2 WHERE exists((s) -[:ENROLLED_IN]→ (c) ←[:TEACHES]- (i)) AND exists((i) -[:ENROLLED_IN]→
  (:Course) ←[:TEACHES]- (s)) AND id(s) <> id(i)
3 MERGE  (s) -[:CO_TEACH]→ (i) -[:CO_TEACH]→ (s);
```

Results (screenshot below):

Q4 J:

Query:

```
MATCH path = shortestPath((i1: Instructor) -[*..5]- (i2: Instructor))
WHERE i1.uid = "1" AND i1.uid <> i2.uid
RETURN DISTINCT min(length(path));
```

Results (screenshot below):

```
╒═══════════════════════╕
│"min(length(path))"    │
╞═══════════════════════╡
│2                      │
└───────────────────────┘
```

Query:

```
MATCH path = shortestPath((i1: Instructor) -[*..2]- (i2: Instructor))
WHERE i1.uid = "1" AND i1.uid <> i2.uid AND length(path) = 2
RETURN i2.uid;
```

Results (screenshot below):

```
╒═══════════╕
│"i2.uid"   │
╞═══════════╡
│"82"       │
├───────────┤
│"132"      │
├───────────┤
│"157"      │
├───────────┤
│"493"      │
├───────────┤
│"73"       │
├───────────┤
│"179"      │
└───────────┘
```