School of Computing and Information Technology

Student to complete:

Family name	
Other names	
Student number	
Table number	

CSCI235
Database Systems

Final Examination Paper
Session 4 2021
(1 December 2021)

Exam duration	3 hours and 40 minutes
Weighting	40% of the subject assessment
Marks available	40 marks
Items permitted by examiner	Text-book, Lecture slides, and Tutorial notes
Directions to students	4 questions to be answered. Marks for each question are shown beside the question. All answers must be written in the answer booklet provided.

This examination is a take-it-home examination to be done on-line on the date of examination.

Version 2.0

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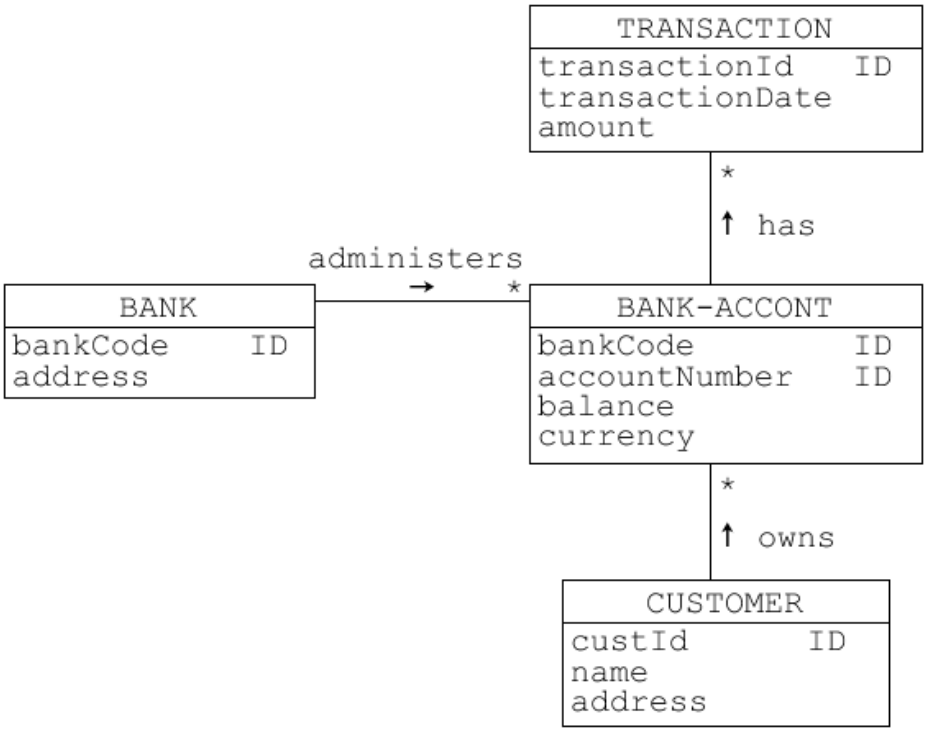
Question 4 (Total 10 marks)
BSON document

Time allocated: 50 minutes
Start time: 4:55 pm SGT
End time: 5:45 pm SGT
Submission time start: 5:40 pm SGT
Submission time end: 5:55 pm SGT

a) Consider the following conceptual schema of a sample database that contains information about a bank, the bank-accounts administered, the owners bank account, and the transactions made.



Write a sample BSON document which structure is consistent with the conceptual schema given above. Your document must contain information about at least one bank, two bank accounts, two customers, and three transactions. One of the bank account has two transactions and another one of the bank account has the remainder one transaction. The values for the attributes are up to you but must be sensible.

(5.0 marks)

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b) Consider a sample BSON document given below. Assume that all documents in a collection `trafficReport` has the same structure as the document shown below:

```
db.trafficReport.insert(
{ "_id":"TR27Nov2021",
  "TRAFFIC-POLICE": [ {"tpIdNum":"KB001",
                       "tpName":"Kevin Brown",
                       "makeReport": [ {"reportId":"TO-001",
                                        "reportDate": "7-October-2021",
                                        "hasViolation": [
                                             {"violationId":"VID-001"}]},
                                       {"reportId":"TO-002",
                                        "reportDate": "12-November-2021",
                                        "hasViolation": [
                                             {"violationId":"VID-002"}]}
                     ] },
                     {"tpIdNum":"TM001",
                      "tpName":"Thomas Moore",
                      "makeReport": [ {"reportId":"TO-003",
                                       "reportDate": "7-October-2021",
                                       "hasViolation": [
                                             {"violationId":"VID-002"}]}
                     ] } ],
  "VIOLATION": [ {"violationId": "VID-001",
                  "description": "Speeding",
                  "penalty": "$200 fine + 6 points deduction."},
                 {"violationId": "VID-002",
                  "description": "Use mobile device while driving",
                  "penalty": "$150 fine + 3 points deduction and confiscate
the mobile device."}],
  "OFFENDER": [ {"offenderId":"GB001",
                 "offenderName":"George Brown",
                 "offenderAddress":"10 Bukit Timah Road",
                 "hasTOReport": [ {"reportId":"TO-001"},
                                  {"reportId":"TO-003"}]},
                {"offenderId":"LH001",
                 "offenderName":"Laura Hall",
                 "offenderAddress": "321, Linsey Road",
                 "hasTOReport": [ {"reportId":"TO-002"}]}]
} );
```

Use either a method *find*() or a method *aggregate*() available in MongoDB to write the implementations of the following queries. Implementation of each query is worth 1 mark.

(i) Find the details of traffic police who have made a report on 7-October-2021. Do not show the objectId. **(1.0 mark)**

(ii) Find the details of offenders who have had more than one traffic offence reports (hasTOReport). **(1.0 mark)**

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(iii) Find the total number of reports made by each traffic police. For each traffic police, list the traffic police id number (tpIdNum), name (tpName), and the total number of reports made. **(1.0 mark)**

Use the method $update()$ to write the implementations of the following data manipulation operations. Implementation of each data manipulation operation is worth 1 mark.

(iv) Add a new element into the violation (VALITION) array. The information of the new violation are as follow: Violation id: "VID-003", description: "Drink-driving", and penalty: "$2000 fine + 1 year jail term."

(1.0 mark)

(v) Update the address (offenderAddress) of George Brown, an offender, to "10 Jalan Bukit Timah". **(1.0 mark)**

END OF EXAMINATION

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