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 2020
(2 December 2020)

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	Answer all the 4 questions.
	Marks for each question are shown beside the question.
	All answers must be hand-written in A4-size or foolscap paper.

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

Version 3.0

Question 4   (Total 10 marks)
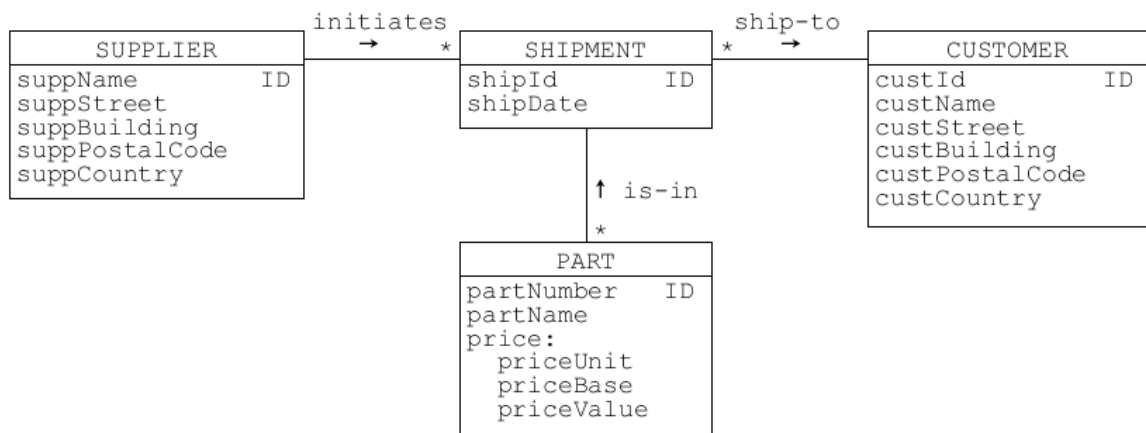## BSON document

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 the supplier's shipments to customer.

```
        initiates              ship-to
┌──────────────┐ →     * ┌──────────────┐ *  → ┌──────────────┐
│  SUPPLIER    │         │  SHIPMENT    │       │  CUSTOMER    │
├──────────────┤         ├──────────────┤       ├──────────────┤
│ suppName  ID │         │ shipId    ID │       │ custId    ID │
│ suppStreet   │         │ shipDate     │       │ custName     │
│ suppBuilding │         └──────┬───────┘       │ custStreet   │
│ suppPostalCode│               │               │ custBuilding │
│ suppCountry  │             ↑ is-in            │ custPostalCode│
└──────────────┘               │               │ custCountry  │
                               *               └──────────────┘
                      ┌──────────────┐
                      │    PART      │
                      ├──────────────┤
                      │ partNumber ID│
                      │ partName     │
                      │ price:       │
                      │   priceUnit  │
                      │   priceBase  │
                      │   priceValue │
                      └──────────────┘
```

Write the sample JSON documents that have a structure consistent with the conceptual schema given above.

An important objective of the design is to maximize the size and complexity of the hierarchical structures in the documents and in the same moment eliminate any redundancies from the documents.

Your document must contain information about at least one supplier, two shipments, two customers, and three parts; one of the shipment contains two parts and the other shipment contains one of the remaining part. The values for the attributes are up to you but must be sensible.

(5.0 marks)

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(
{"TRAFFIC-REPORT": {
    "TRAFFIC-POLICE": [
        {"tpIdNum": "KB1215195",
         "tpName": "Kevin Brown",
         "REPORT": [
             {"reportId": "TO6221-PJ01",
              "reportDate": "7-April-2019",
              "VIOLATION": [
                 {"violationId": "TO6221-PJ01-001",
                  "description": "Speeding",
                     "penalty": "$200 fine + 6 points deduction.",
                     "offender": "GB1852019"}]},
            {"reportId": "TO9221-PJ02",
              "reportDate": "12-May-2019",
              "VIOLATION": [
                 {"violationId": "TO6221-PJ01-002",
                  "description": "Use mobile device while driving.",
                     "penalty": "$150 fine + 3 points deduction and
confiscate the mobile device.",
                     "offender": "LH1204195"}]}]},
        {"tpIdNum": "TM1215195",
         "tpName": "Thomas Moore",
         "REPORT": [
             {"reportId": "TO6221-PJ01",
              "reportDate": "7-April-2019",
              "VIOLATION": [
                 {"violationId": "TO6221-PJ01-001",
                    "description": "Speeding",
                    "penalty": "$200 fine + 6 points deduction.",
                    "offender": "GB1852019"}]}]}
            ],
    "OFFENDER": [
        {"offenderId": "GB1852019",
         "offenderName": "George Brown",
         "offenderAddress": "10 Bukit Timah Road"},
        {"offenderId": "LH1204195",
         "offenderName": "Laura Hall",
         "offenderAddress": "321, Linsey Road"}
          ] }
} );
```

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 traffic police id (tpIdNum) and name (tpName) who have submitted a traffic violation report on 7 November 2020. Do not show the object identifier.** **(1.0 mark)**

(ii) **Find the total number of traffic police.** **(1.0 mark)**

(iii) **Display in a pretty format the offenders' id, name and address of all offenders. Note: Display only the offenders' details.**
(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 traffic police to the existing BSON document. The id and name of the new traffic police are "JC1984327" and "John Clark" respectively.** **(1.0 mark)**

(v) **Delete from the traffic police document the traffic police Thomas Moore, including the report submitted by Thomas Moore.** **(1.0 mark)**

END OF EXAMINATION