



## **FACULTY OF SCIENCE**

### **ACADEMY FOR COMPUTER SCIENCE AND SOFTWARE ENGINEERING**

<b>MODULE</b>	<b>IT08X31 - SERVICES COMPUTING</b>
<b>CAMPUS</b>	<b>APK</b>
<b>FINAL SUMMATIVE ASSESSMENT (EXAM)</b>	<b>JUNE 2020</b>

**DATE: 11 JUNE 2020**

**SESSION 08:30 – 11:30**

**ASSESSOR(S)**

**PROF M COETZEE**

**EXTERNAL MODERATOR**

**PROF HS VENTER (UP)**

**DURATION: 3 HOURS**

**MARKS: 75**

*2.5 hours to write, 30 min to upload/download*

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**NUMBER OF PAGES: 4 PAGES**

**INSTRUCTIONS:**

- Answer all the questions.
- You may use Microsoft Word (or equivalent) and Microsoft Visio (or equivalent) to answer your questions.
- Type your name at the top of the document. Clearly number the questions, leaving spaces between questions. Include the diagrams directly in the document at the correct place.

- Once you are finished writing, please save the document as a PDF and upload a single document. Create a document using your student number and surname as file name.
  - You only need Internet access to download the exam and then to upload your final submission. You do not need to be connected for the duration of the test.
  - Should loadshedding be implemented during the day, we will communicate with you.
  - While it is advised that you type the test, you may also write the test by hand, on paper. If you do this, please number the physical pages before scanning/taking the photos. After that you must use CamScanner or take CLEAR photographs and upload.
  - During the exam, if you have any queries, you can contact me via our Discord server channel or email me at marijkec@uj.ac.za
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### **QUESTION 1**

- a) Define the term "loose coupling" as it is understood in the *microservices* domain. (3)
- b) Low Cohesion and loose Coupling is often mentioned in the context of microservices. Do you agree with this statement? Explain why. (2)
- c) *Given:* There is a collection of microservices that communicate with each other through REST interfaces in a synchronous manner.
- i) Comment on this design approach with respect to how loose coupling is supported. Be very specific in your answer. (6)
- ii) Explain how loose coupling could be better supported in this case. Motivate your answer well. (3)
- d) *Given:* There is a collection of microservices that are each directly accessed by mobile and web clients.
- i) Comment on this design approach with respect to how loose coupling is supported. Be very specific in your answer. (3)
- ii) Provide a solution that would better support loose coupling. Motivate your answer well. (3)

**[20]**

### **QUESTION 2**

- a) Given the following table giving **REST operations** and **HTTP commands** as related to SQL operations.

REST OPERATION	SQL	HTTP COMMAND
a)	INSERT	e)
b)	SELECT	f)
c)	UPDATE	g)
d)	DELETE	h)

Match the following terms to each of the spaces (a) to (h). (4)

List your answers from (a) to (h) as e.g. **a) 9** where column (a) is supported by item (9)

- 1) Create
- 2) PUT / POST / PATCH,
- 3) Delete
- 4) Update
- 5) GET
- 6) Read
- 7) PUT / POST
- 8) DELETE

b) The Twitter API lets you access your friends with the following call over HTTP:

GET [https://api.twitter.com/1.1/friends/ids.json?cursor=-&screen\\_name=twitterapi&count=50](https://api.twitter.com/1.1/friends/ids.json?cursor=-&screen_name=twitterapi&count=50)

Then, the reply is similar to shown below (a list of the identifiers of 50 friends):

```
{
  "previous_cursor": 0,
  "ids": [
    2044,
    ...,
    2094
  ],
  "previous_cursor_str": "0",
  "next_cursor": 0,
  "next_cursor_str": "0"
}
```

- i) Classify this REST call according to the Richardson maturity model and motivate why you choose the level. (2)
- ii) As a developer, what can you deduce from what is given by the response? What will be the next step that you will code? (2)
- iii) Provide a better solution to solve this problem. Explain why it will be better and what you foresee you will implement. (5)
- iv) Explain the effect of your solution on the loose coupling of your system. (2)

**[15]**

**QUESTION 3**

A **SOAP web services application** needs to encrypt part of a message when sending it from a service provider to a service consumer.

*Use a diagram in your answer – question (c). You may draw the diagram on paper, take a photo of it, and copy it to your document, or you may use Word shapes/Visio or another tool to draw the diagram.*

- a) Describe a solution to this scenario and discuss all relevant considerations. (4)
- b) Explain the structure of the encrypted request. (4)
- c) Give the architecture of the application – draw a diagram. (3)
- d) Describe any software patterns that can be used to implement the solution effectively. (4)
- e) Describe how you will encrypt a request send to a **RESTful service**. (3)
- f) What is the main difference between encrypting a SOAP versus a REST service? (2)

**[20]**

**QUESTION 4**

Given the following doctor's appointment application composed of the following microservices:

- Patient
- Search
- Doctor
- Appointment
- Notification

If a patient wants to create an appointment, the UI would perform a POST request to `/api/appointment` with the data in the request body. A question to consider is if the *Appointment database* would be required to store data from the *Patient database* (patient\_id, pname, first name, last name, age, phone number) of the Patient microservice?

- a) Comprehensively discuss the challenges of data storage for microservices. (6)
- b) Provide a solution for the problem stated here. (3)
- c) Give a diagram of your architecture. (4)
- d) Describe a pattern you will be using in your solution. (3)
- e) Give the advantages and disadvantages of this approach. (4)

**[20]**