Chair of Software Engineering for Business Information Systems
Department of Informatics
Technical University of Munich

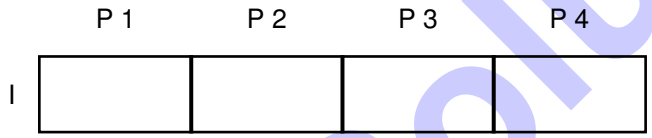
Esolution
Place student sticker here

Note:

- During the attendance check a sticker containing a unique code will be put on this exam.
- This code contains a unique number that associates this exam with your registration number.
- This number is printed both next to the code and to the signature field in the attendance check list.

Software Engineering für betriebliche Anwendungen - Masterkurs: Web Application Engineering

Exam:	IN2087 / Endterm	**Date:**	Monday 3rd August, 2020
Examiner:	Prof. Dr. Florian Matthes	**Time:**	13:30 – 14:15



Working instructions

- This exam consists of **8 pages** with a total of **4 problems**.
  Please make sure now that you received a complete copy of the exam.
- The total amount of achievable credits in this exam is 24 credits.
- Detaching pages from the exam is prohibited.
- Allowed resources:
  - one **analog dictionary** English ↔ native language
- The working time is 45 minutes.
- Points are also awarded for correct solution approaches if the final result is faulty or missing. Therefore, please explain your solution approaches as precisely as possible!
- If you give correct final results on the basis of missing, wrong or insufficient justifications, no or only partial points will be credited. Solutions are part of the solution and must be fully explained!
- In the event of attempts at cheating, the exam will be graded with 0 points.
- Do not write with red or green colors nor use pencils. Such information will NOT be taken into account in the correction!
- Physically turn off all electronic devices, put them into your bag and close the bag.

Left room from _____ to _____ / Early submission at _____

Problem 1 Business Models (4 credits)

You have recently become a consultant in an IT consulting company. One of your customers wants to develop and deploy a new platform. You discuss different business models with the customer.

0 1 a) What is a business model, as defined in the lecture?

A business model is the method of doing business by which a company can sustain itself - that is, generate revenue.
and/or
The business model spells-out how a company makes money by specifying where it is positioned in the value chain.

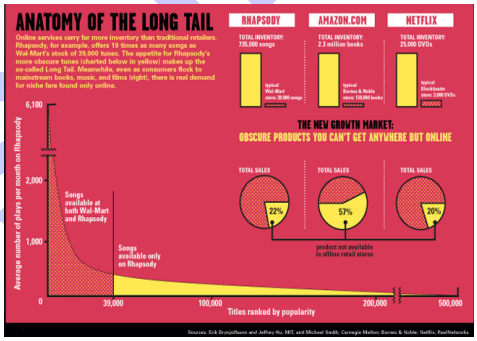
0 1 b) Briefly describe the Merchant Model.

Wholesalers and retailers of goods and services.Hereby sales may be made based on list prices or through auctions.

0 1 c) What is the difference of the Merchant Model to the Brokerage Model?

A merchant usually creates and inventory.
or
A merchant is involved in distribution.

0 1 d) Briefly describe the so-called "Long Tail" in the context of the Merchant Model.



Problem 2 Web Applications (6 credits)

After you have acquired the project for your consulting company, you collect the requirements for the platform to be developed. First of all, it should be clarified which kind of web application will be developed.

a) What are Single-Page Applications (SPA)? What is their difference to traditional websites from a usability perspective?

0 1 2

With **one** request, the web server serves a “single page” which either already contains all views including HTML templates, CSS style sheets, and JS logic, or dynamically loads required resources. The **actual data** is loaded **asynchronously**, typically via a REST API.

b) What are challenges for Single-Page applications in the context of navigation and routing?

0 1 2

- New content is loaded via Ajax and a state change by URL is not necessary
- How to control and preserve the browser history for Ajax applications?
- How to manage states?
- How to make SPAs “linkable”?

c) Briefly describe general web components as presented in the lecture.

0 1 2

A **component** in software engineering is an element that bundles a **set of related functions and data**.Each component is a self-contained piece of software. A component-based architecture emphasizes the **separation of concerns** and the **single responsibility principle**.

Problem 3 React (7 credits)

In a next appointment you explain to your customer that you would like to do a development based on React for the project. However, the customer is initially skeptical, partly because he has not yet fully penetrated the concepts behind React. Therefore, you explain some background information about React to the customer.

0 1

a) Describe the concept of the Virtual DOM.

DOM operations are costly. A virtual DOM is a “layer” between JavaScript and the actual DOM that reduces the number of DOM operations.

0 1 2 3 4

b) Explain the React solution to state management problems

- Components encapsulate state
- The state is stored in immutable JavaScript objects
- Similar to the functional programming paradigm, only new/copies of state objects are created
- A component’s state is assigned once in the constructor of a component and state updates are carried out via the setState(newStateObject) method of React components that gets passed a new state object as a parameter rather than manipulating the state object directly
- State is strictly passed down in the component hierarchy
- A core concept of React is to handle state in the closest common ancestor component, when components depend on the state of other components
- In React terminology this process is called “lifting state up”

0 1 2

c) Consider the following JSX code. Fill out the outputs, name, and explain the “...” operator.

```
let attrs = {foo: 'x', bar: 'y'};
let c = <React.Component {...attrs} />;
console.log(c.props.foo); /* output:___________ */
console.log(c.attrs);     /* output:___________ */
```

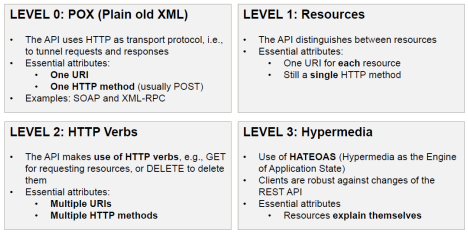
First output is ’x’, second output undefined
The **spread operatoraddresses all properties of an object with arbitrary many**properties.

Problem 4 REST (7 credits)

Next, you discuss potential paradigms and design of the interface to the backend with your customer. You will explain the concepts behind the Representational State Transfer (REST), as well as document-oriented databases.

a) Name three levels of the REST API maturity model and describe additionally one of them.

0 1 2



b) When requesting wwwmatthes.in.tum.de via your web browser, which are the values of the three parts of the REST triangle?

0 1

Verb: GET
Content Type: HTML
Noun: https://wwwmatthes.in.tum.de

c) Briefly describe the concept of document-oriented databases. Furthermore, briefly describe two advantages of document-oriented databased compared to relational databases.

0 1 2 3

- Data is stored in versioned and potentially deep documents
- Usually the semi-structured documents are stored in JSON
- Can be organized by collections which enables the definition of queries and indexes

Advantages:

- Schema free
- Tolerant against incomplete data

Additional space for solutions–clearly mark the (sub)problem your answers are related to and strike out invalid solutions.