##### Assessment framework for SEE (Theory) – 100 Marks / 3 hours (Reduced to 60 marks)

Programme: Computer Science & Engineering Semester: V

Course: Full Stack Web Development Max Marks: 100

Course Code: 20CS52I Duration: 3 Hrs

**1 a.Digital transformation is creating new — or modifying existing — business processes, culture, and customer experiences to meet changing business and market requirements. Explain how digital transformation has brought revolution in retail purchases with an example. L4 10 marks**

Ans. With the advancement of technology in the 21st century, The retail sector is experiencing a global revolution, and the whole credit goes to digitalization.The internet and mobile devices have enabled consumers to connect with companies.

Digital transformation includes a more comprehensive and effective range of business opportunities. The retail industry is rapidly adopting digital transformation methodologies to revolutionize the entire process.

Digital transformation has eliminated traditional technologies' limitations and helped the retail industry be more responsive to the current market trends and demands. It has helped the industry to analyze existing workflows and review diverse operating models based on their agility, speed, functions, customer involvement, etc.

Technological advancement has completely changed the mode of shopping as the faster technology and smartphones have made internet shopping available at people's fingertips. The in-store shopping experience has also transformed with digital transformation as several stores provide screens or iPads to view product specifications and provide information for marketing lists and customer relationship management.

### Example : Multi-channel & Social Media Marketing

When brands combine channels such as whatsapp, email, SMS,  facebook, instagram into one cohesive marketing campaign they can reach the right customer with the right message, **on the channel they respond to  best.** Customer life cycle management by adding them to nurturing campaigns and having constant touch points with your customer is the key focus here. The three buzzwords that you just cannot forget here are customer engagement, customer retention and user journey mapping.

**1 b. Diagnostic imaging procedures are cutting-edge technology, but at the same time they are an unpleasant experience for patients – and even more for paediatric patients. Explain how design thinking helped Doug Dietz, an industrial designer, create a scanner experience that children loved.**

**Ans.** A great story of design in product development comes from Doug Dietz, a principle designer for GE Healthcare. After spending two years designing a new MRI scanner, he was excited to see it in action. But at the hospital, as he observed a young family with a child approaching, he realised that the child was terrified.

Investigating the issue further, Dietz discovered that paediatric patients were so frightened of the scanners that 80% of young patients had to be sedated before being scanned, creating even more stress for patients and parents at an already worrying time. The experience was a huge wake-up call for Dietz, who felt he’d failed in his job as a product designer. To solve this problem, he gathered a team of design experts, hospital employees, and staff from a local children’s museum, and engaged in his own form of market research by having children draw and colour in their own idea of an adventure. Drawing from the fertile imaginations of children, the team’s work resulted in the GE Adventure series, installed as a pilot scheme in the University of Pittsburgh. These MRI scanners were designed with soft round edges instead of hard corners and themed around jungles, pirate islands, and underwater castles, with the rooms utilising multi-sensory immersive techniques such as lighting, music and aroma to put young patients at ease.

**2 a. Identify the tasks involved in the process of receiving Admission Ticket for semester exams in your college. Which of the identified tasks can be automated and illustrate automation of one task.**

Ans. The tasks involved in the process of receiving Admission Ticket for Semester exams are-

1. Filling up of Semester Exam Application Form with student details & subject details.
2. Confirming clearance from various departments and subject incharges.
3. Making payment of semester exam fees manually.
4. Submission of semester exam application form alongwith fees receipt in office.
5. Dispatching all students semester exam forms to Board of semester examination.

In all above tasks manual intervention is required which has got tendency of committing so many mistakes.In the first task students commit so many mistakes in filling all the details in the examination application form.For second task students need to spare lot of their study time in visiting all departments and taking clearance from concerned staff members.Again in third task students have to spend more time in going to bank and filling up payment channel and taking receipt of payment and enclosing it with semester examination form then coming back to college office to submit the completed semester exam form with payment receipt.

In order to overcome from above cited problems we need to follow automation in various tasks.The first task if automated by developing a mobile application students can complete the most tedious job of filling up of semester exam application form within few minutes during their leisure time. All concerned departments have to enable the respective student’s examination form after confirming their concerned dues. Once student exam form is enabled ,students need not to fill all the required details as the same is pre-filled by the app ,student need to to enter only register number. And student can make exam fees payment through digital payments gateways such as PhonePay,G-Pay etc.

# **2 b. Identify the following cloud service types and list their characteristics and advantages.**

# **Cisco WebEx Google App Engine, Amazon EC2**

# Ans.**Cisco Webex** is a video conferencing and collaboration product suite. This cloud-based collaboration suite is comprised of software including Webex Meetings, Webex Teams and Webex Devices

# The Best characteristics and advantages of Cisco WebEx:

* Voice options from phone or computer audio, HD video.
* Users can join calls on multiple devices, and can switch devices mid-call.
* Users can share various files among participants, and content sharing extensions are available for

web use.

* Annotation tools are available.
* Calls can be recorded.
* Chat and screen share features are available.
* Screens can be controlled remotely.
* Added security features.
* Integrates with applications such as Cisco and Microsoft Teams.

**[Google App Engine](https://www.infiflex.com/google-app-engine-benefits" \t "_blank" \o "Google App Engine)** is a cloud computing Platform as a Service (PaaS) which provides Web app developers and businesses with access to Google’s scalable hosting in Google managed data centers and tier 1 Internet service.

The Best characteristics and advantages of of Google App Engine:

* Language support: Google App Engine lets users’ environment to build applications in some of the most popular languages, including Java, Python, Ruby, Golang, Node.js, C#, and PHP.
* Flexibility: Google App Engine offers the flexibility to import libraries & frameworks through Docker containers.
* Diagnostics:Google App Engine uses cloud monitoring and logging to monitor health and performance of an application which helps to diagnose and fix bugs quickly.
* Traffic splitting:Google App Engine automatically routes the incoming traffic to different application versions as a part of A/B testing.
* Security:Google App Engine enables users to define access rules in Engine’s firewall and utilize SSL/TLS certificates on custom domains for free.

**Amazon EC2** : Amazon Elastic Compute Cloud (Amazon EC2) provides scalable computing capacity in the Amazon Web Services (AWS) Cloud.

The Best characteristics and advantages of Amazon EC2 :

* Virtual computing environments, known as instances
* Secure login information for your instances using key pairs
* Persistent storage volumes for your data using Amazon Elastic Block Store (Amazon EBS), known

as Amazon EBS volumes

* A firewall that enables you to specify the protocols, ports, and source IP ranges that can reach your

instances using security groups

* Static IPv4 addresses for dynamic cloud computing, known as Elastic IP addresses
* Metadata, known as tags, that you can create and assign to your Amazon EC2 resources
* Virtual networks you can create that are known as virtual private clouds (VPCs)

**3 a. BookingHall is an online convention hall booking application that helps its users to book hall for functions across Karnataka. This application allows users to log in for booking a hall. Users can find the halls in a specific locality. Once found, user can check the availability of a hall for specific dates. Users can block a hall for required duration. Once blocked, user can get the booking details. Identify and write the user stories for this application. L4 12 Marks**

**.**

**Ans. The following user stories are identified to fulfill the requirements**

**1.** As a registered user, I am required to log in so that I can access the system www.bookinghall.com.

2. As a forgetful user, I can request a password reminder so that I can log in if I forget mine.

3. As a logged in user I am able to see the list of location so that I can select the required place to book a hall.

4.As a logged in user to pick my planned dates so that I can verify the availability of hall for the specific duration.

5. As a logged in user I am able to book the hall by blocking it on the verified dates to plan for my planned event.

6. As a registered user I am able to see the hall rent for one day and then automatically total rent for the specific duration will be calculated.

7.As a registered user I must make advance payment of either partial or full payment so that I can confirm my hall booking.

8.As a registered user I am required to cancel my booked hall due to unexpected event so that I can get refund of my advance payment.

**3 b Write test cases for the above application. L3 8 Marks**

**Ans.** **Test Cases for** online convention hall booking application**: W**e will discuss how to write test cases for hall booking application. The Test Case Scenarios are high-level and will cover a multitude of functional tests.

* Check the BookingHall online convention hall booking application will be loaded consistently after proving the correct URL.
* Check whether registered user will be logged in after providing correct login credentials.
* Check whether shall be able to search the availability of hall in the required location.
* Check by entering a valid “From” date in the date picker field.
* Check by entering a valid “To” date in the date picker field
* Check the availability of convention hall is available for the duration mentioned.
* Check whether user is able to block the hall.
* Check the confirmation of booking the hall for the required duration.
* Check if the user can make a successful payment for their hall booking.
* Check on canceling the reservation. The system refunds money to the same address

**4 a. eDesert is an online shopping application that helps its users to buy variety of authentic deserts. This application allows users to log in for buying deserts. Users can search for a desert, sort the desert list based on rating or price. Users can select the items and add them to the cart. Once the selection is done, users can go to the cart page for payment. Identify and write the user stories for this application**. L4 12 Marks

Ans. eDesert is an online shopping application that helps its users to buy variety of authentic deserts. The following user stories are required to develop this online shopping application.

* As a registered user, I am required to log in so that I can access the system [www.edesert.com](http://www.edesert.com)
* As a user, I want to find nearby restaurants so that I can get deserts delivered to my address.
* As a user I want to add/remove multiple desert items so that I can specify what I want to order.
* As a user I want to be able to repeat my previous orders (with or without modifications) at the click of a button.
* As a user I want to know how much time food delivery will take so that I know how much I have to wait.
* As a user I want to call up the restaurant so that I can check progress.
* As a user I want to be able to see where my delivery guy is on the route to my address.
* As a user I want to have flexible online payment options so that I can choose any method of my choice.
* As a user I want to be able to rate my experience on various parameters such as food, delivery, payment, customer service using a scale of 1 to 5.

**4b. Write test plan and test cases for the above application. L3 8 Marks**

## **Ans.** General Test Cases for eDessert online Ecommerce Application.

1. Verify that all the required fields – username, email, password, confirm password, etc are present on the registration page.
2. Verify that the user is able to navigate through all the desserts across different categories.
3. Verify that all the information displayed – product name, category name, price, and product description is clearly visible.
4. Verify that category pages have a relevant product listed, specific to the category.
5. Verify that the correct count of total products is displayed on the category pages.
6. Search – Verify that on searching, all the products satisfying the search criteria are visible on the search result page.
7. Filtering – Verify that filtering functionality correctly filters products based on the filter applied.
8. Sorting – Verify that all the sort options work correctly. On sorting the products based on the sort option chosen.

**5 a. The HR team of an organization needs an application to maintain its employee details.**

**Create a Spring Boot application to maintain Employee details such as employee id, employee name, and department and perform the following database operations.**

* **Insert a new employee detail**
* **Remove employee details based on employee id**
* **Search employee based on name or ID L 3 12 Marks**

Ans. For answer to the above question refer this video : https://youtu.be/-LthFHW4Org

**5 b. Design an application that consumes EmailService , to send emails to recipient mail addresses. The design should accommodate any new email services. It should also support additional messaging feature. L3 8 marks**

Ans. Nodemailer is a Node.js module used for sending emails and is the most popular Node.js email package. You can use Nodemailer to create HTML or plain-text emails, add attachments, and send your emails through different transport methods, including built-in SMTP support. It requires Node.js 6.0 or newer.

**1.** Let’s send email using Nodemailer. The first step is to create a Node.js application:

*mkdir email-nodeapp && cd email-nodeapp*

Here you’ve created a folder and initialized a package.json file using the npm init command. The -y flag is there to skip the interactive back-and-forth questions by npm.

2.Next, install the Nodemailer module:

*npm install nodemailer*

3. Create a Mailtrap account if you don’t already have one. In the Integrations dropdown on the dashboard, select Nodemailer and copy the credentials displayed.

4. Create an email.js file and add the following:

*const nodemailer = require('nodemailer');*

*let transporter = nodemailer.createTransport({*

*host: 'smtp.mailtrap.io',*

*port: 2525,*

*auth: {*

*user: "<user>",*

*pass: "<pass>"*

*}*

*})*

5. Substitute the host, user, and password with the Mailtrap credentials you copied from the dashboard above. Now you can send an email using the sendMail method of Nodemailer’s createTransport function.

Append the following to the email.js:

*message = {*

*from: "from-example@email.com",*

*to: "to-example@email.com",*

*subject: "Subject",*

*text: "Hello SMTP Email"*

*}*

*transporter.sendMail(message, \*\*function\*\*(err, info) {*

*if (err) {*

*console.log(err)*

*} else {*

*console.log(info);*

*}*

1. Nodemailer also supports sending emails using HTML. All you need to do is add the html attribute to your message object like so:

*message = {*

*from: "from@email.com",*

*to: "to@email.com",*

*subject: "Subject",*

*html: "<h1>Hello SMTP Email</h1>"*

*}*

1. To test that it works, go to your terminal and run:

*node email.js*

**6 a. The write operations on the collection are very high. Explain the technic applicable to manage the given scenario. L3 12 Marks**

**6 b. Compare the database communication through JDBC and ORM. L3 8 marks**

### Ans. Difference Between ORM and JDBC

ORM when compared to JDBC is easier to work with as it does all the work by itself. It maps Java classes to the database variables via XML. While working with domain-driven applications and in the case of complex object relationships, ORM is mostly preferred but when the application is simple enough then it is better to use JDBC.

| Object Relational Mapping | Java Database Connectivity |
| --- | --- |
| Little slower than JDBC | It is faster compared to ORM |
| SQL queries requirement is comparatively quite less however this doesn’t mean that you have to do less work using ORM | SQL queries are required here |
| Hibernate framework (working on ORM technology) makes it easy to store objects/data to database automatically without writing manual code | We have to write code manually to store objects/ data in the database |
| The flow from Object/data to hibernate i.e. the frontend part is based on the ORM technique | Whereas when the data is stored in the database finally i.e., the backend part is still based on JDBCin |
| There are not many restrictions while dealing with data. Even a single database cell can be retrieved, changed, and saved. | JDBC comes with a lot of restrictions on extracting the result-set, processing it, and then committing it back to the database. |

**7 a. Ram is a developing a feature of an online apparel application as service. How should he**

**handle the different requests to the service. L3 12 Marks**

**Ans.**Ram a software developer is developing online apparel application handles the different requests to the service in following way

Book a apparel

Get apparel Booking details

Payment

Cancel

ApparelBookingAPI

Input: Booking details as part of HTTP request body

It invokes the bookapparel() method of Bookingapparel class which returns an apparel id.

GetBookingDetails

Get apparel booking details based on mobile number of user

Payment

Get the total amount

Redirect to payment gateway

Cancel

Get the details based on the apparel id

Refund

**7 b. Users of Instagram, a photo sharing application, can share photographs not only with Instagram friends but also with friends on other social networking applications such as Twitter and Facebook. Explain how is this possible. L3 8 marks**

**Ans**

**8 a.** **Develop the data access layer of the Employee Management Application to perform the**

**database operations given below using Spring Data JPA**

**Add the operation given below using Spring Data JPA:**

**Update the employeeContactNumber for the given employee id.**

void update using save Method()

{

// find or retrieve an entity by id

Long id=1L;

Employee emp=emprepositor.findbyId(id).get();

// Update entity information

emp.setcontactnumber(update”contactnumber”);

emp.setdescription(Updated contact “);

// save update entity

EmpRepository.save(emp);

}

**8b. Create a RESTcontroller class to perform CRUD operations on product and corresponding request and response DTOs.**

**The product class should contain three data members product name, product category, price. Use proper SpringBoot annotations.**

**Ans.**

package net.codejava;

import java.util.\*;

import org.springframework.beans.factory.annotation.\*;

import org.springframework.http.\*;

import org.springframework.web.bind.annotation.\*;

@RestController

public class ProductController {

@Autowired

private ProductService service;

// RESTful API methods for Retrieval operations

@GetMapping("/products")

public List<Product> list()

{

return service.listAll();

}

// RESTful API method for Create operation

@PostMapping("/products")

public void add(@RequestBody Product product)

{

service.save(product);

}

// RESTful API method for Update operation

@PutMapping("/products/{id}")

public ResponseEntity<?> update(@RequestBody Product product, @PathVariable Integer id) {

try {

Product existProduct = service.get(id);

service.save(product);

return new ResponseEntity<>(HttpStatus.OK);

} catch (NoSuchElementException e) {

return new ResponseEntity<>(HttpStatus.NOT\_FOUND);

}

}

// RESTful API method for Delete operation

@DeleteMapping("/products/{id}")

public void delete(@PathVariable Integer id) {

service.delete(id);

}

}

**9a. Discuss the Components of Docker container. L3 6 Marks**

### Ans. Basic Docker Components:

* **Docker Client**: The first component of Docker is the client, which allows the users to communicate with Docker.
* **Docker Image**: Docker images are used to build containers and hold the entire metadata that elaborates the capabilities of the container.
* **Docker Daemon**: Docker Daemon is among the most essential components of Docker as it is directly responsible for fulfilling the actions related to containers. The Docker daemon will only respond to the Docker API requests to perform the tasks.
* **Docker Networking**: As the name suggests, Docker networking is the component that helps in establishing communication between containers.
* **Docker Registry**: Docker images require a location where they can be stored and the Docker registry is that location. Docker Hub is the default storage location of images that stores the public registry.
* **Docker Container**: A Docker container is the instance of an image that can be created, started, moved, or deleted through a Docker API. Containers are a lightweight and independent method of running applications. They can be connected to one or more networks and create a new image depending on the current state.

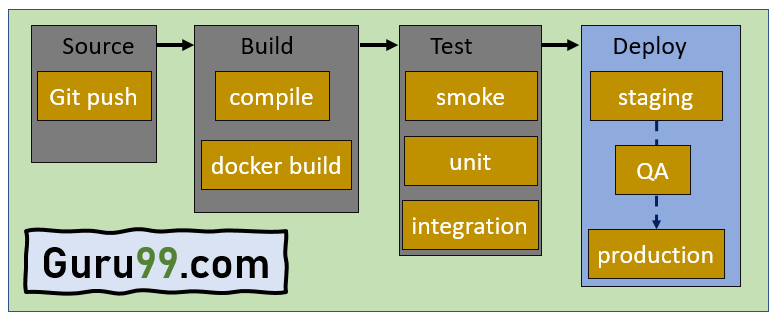
**9 b. Draw the CI/CD build process flow diagram for an online foot ware store application and**

**explain each component. L3 6 Marks**

**Ans** Ans 9b)

Stages of a CI/CD pipeline

A CI/CD pipeline is a runnable specification of the steps that any developer should perform to deliver a new version of any software. The important Stages of CI/CD pipeline:



**Source Stage**

In the source stage, CI/CD pipeline is triggered by a code repository. Any change in the program triggers a notification to the CI/CD tool that runs an equivalent pipeline. Other common triggers include user-initiated workflows, automated schedules, and the results of other pipelines.

**Build Stage**

This is the second stage of the CI/CD Pipeline in which you merge the source code and its dependencies. It is done mainly to build a runnable instance of software that you can potentially ship to the end-user.

Programs that are written in languages like C++, Java, C, or Go language should be compiled. On the other hand, JavaScript, Python, and Ruby programs can work without the build stage.

Failure to pass the build stage means there is a fundamental project misconfiguration, so it is better that you address such issue immediately.

**Test Stage**

Test Stage includes the execution of automated tests to validate the correctness of code and the behaviour of the software. This stage prevents easily reproducible bugs from reaching the clients. It is the responsibility of developers to write automated tests.

**Deploy Stage**

This is the last stage where your product goes live. Once the build has successfully passed through all the required test scenarios, it is ready to deploy to live server

**9 c.** **You want to have two versions of your application in production, but be able to switch all traffic**

**between them. Explain the deployment strategy suitable for the given situation. L3 6 Marks**

Ans. Blue-green deployments involve running two versions of an application at the same time and moving traffic from the in-production version (the green version) to the newer version (the blue version). You can use a [rolling strategy](https://docs.openshift.com/container-platform/3.11/dev_guide/deployments/deployment_strategies.html" \l "rolling-strategy) or switch services in a route.

Blue-Green deployments use two deployment configurations. Both are running, and the one in production depends on the service the route specifies, with each deployment configuration exposed to a different service. You can create a new route to the new version and test it. When ready, change the service in the production route to point to the new service and the new, blue, version is live.

If necessary, you can roll back to the older, green, version by switching service back to the previous version.

**10.a. Create a form to add a new product detail to the product catalogue using React. L3 10 Marks**

**Ans.** Forms are a crucial component of [React](https://reactjs.org/) web applications. They allow users to directly input and submit data in components ranging from a login screen to a checkout page.

To begin, open App.js:

*$ nano src/components/App/App.js*

We are going to build a form for purchasing apples. Create a [<div>](https://www.digitalocean.com/community/tutorial_series/how-to-build-a-website-with-html" \l "how-to-use-a-%3Cdiv%3E,-the-html-content-division-element) with a className of <wrapper>. Then add an <h1> tag with the text “How About Them Apples” and an empty form element by adding the following highlighted code:

import React, { useReducer, useState } from 'react';

import './App.css';

const formReducer = (state, event) => {<^>

return {

...state,

[event.name]: event.value

}

}

function App() {

const [formData, setFormData] = useReducer(formReducer, {});

const [submitting, setSubmitting] = useState(false);

const handleSubmit = event => {

event.preventDefault();

setSubmitting(true);

setTimeout(() => {

setSubmitting(false);

}, 3000);

}

const handleChange = event => {

setFormData({

name: event.target.name,

value: event.target.value,

});

}

return(

<div className="wrapper">

<h1>How About Them Apples</h1>

{submitting &&

<div>Submtting Form...</div>

}

<form onSubmit={handleSubmit}>

<fieldset>

<label>

<p>Name</p>

<input name="name" onChange={handleChange}/>

</label>

</fieldset>

<button type="submit">Submit</button>

</form>

</div>

)

}

export default App;

**10 b. Ted is a DevOps engineer. He wants to automate the deployment process. He wants to do deployment frequently on multiple servers and change the CPU speed and RAM based on the requirement. L3 10 Marks**

Ans. Software deployments often require a lot of time as we have to set up a new environment, provision databases, and set up monitoring tools or other dependencies. Deployment automation helps us with all of those tasks and improves the execution accuracy so we can focus on coding instead of repeating DevOps tasks. Continuous deployment releases each codebase change that passes all checks to our production pipeline. In this setup, deployment automation can add extra validation steps before deploying our source code to the production environment.

As different environments have different setups containing multiple servers with changing CPU speed and RAM, it’s best to separate our environment-specific configurations in a Git repository. This way, weu can track changes for all different environments as developers can make updates using Pull Request—a tool they’re already familiar with. By using a version control system for our environment-specific configuration, we increase the audit-ability of your environments. If something goes wrong, we can verify Git’s history to see where and why a specific configuration change got introduced.