Birla Institute of Technology & Science, Pilani
Work Integrated Learning Programmes Division
First Semester 2022-2023
Mid-Semester Test
(EC-2 Regular)

Course No.	:	CSI ZG514
Course Title	:	Introduction to DevOps
Nature of Exam	:	Open Book
Weightage	:	30%
Duration	:	2 Hours
Date of Exam	:	25/09/2022 (Evening)

No. of Pages = 2
No. of Questions = 4

Note to Students:
1. Please follow all the *Instructions to Candidates* given on the cover page of the answer book.
2. All parts of a question should be answered consecutively. Each answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

Q.1 An organization is trying to build an application with multiple MVPs (Minimum Viable product). Time is of essence for this organization as there is a possibility that another competitor is also creating a similar kind of a project. This application needs to work in Embedded devices and browser. With the above scenario in mind, please answer the below questions: [3 + 3 + 4 = 10 Marks]

a) What is the suitable team size for this application development? Justify your answer based on the above scenario.
b) What is the best suitable methodology and development to mitigate this issue? Justify your answer with relevant pointers.
c) Explain the steps needed for this application to become a commercial success in market. Explain all the phases needed for this application from inception to the app release.

a) The suitable team size for this application development would depend on the specific requirements of the MVPs and the timeline for development. Given the time-sensitive nature of the project and the possibility of competition, it would be ideal to have a small and agile team consisting of 5-7 members with diverse skill sets. This would allow for quick decision making, efficient communication, and flexibility in adapting to changing requirements.

b) The best suitable methodology for this project would be Agile development methodology. Agile methodology is well-suited for projects with changing requirements and tight timelines. It allows for continuous feedback, testing, and iteration, which can help the team stay on track and deliver high-quality MVPs quickly. In addition, Agile methodology can help ensure that the team is able to prioritize features based on customer needs, which can help the application stand out in the market.

Some relevant pointers for Agile development in this scenario would include:

- Creating a backlog of MVP features and prioritizing them based on customer needs and market demand
- Breaking down the development into sprints, with each sprint focusing on delivering a set of features
- Conducting frequent reviews and retrospectives to gather feedback and continuously improve the development process
- Encouraging collaboration and communication between team members and stakeholders

c) The steps needed for this application to become a commercial success in the market would include the following phases:

1. Inception phase: This phase involves defining the project goals, MVPs, and identifying customer needs. This would involve conducting market research, analyzing competitor products, and gathering feedback from potential customers.
2. Design phase: In this phase, the team would design the MVPs based on the requirements identified in the inception phase. This would involve creating wireframes, user flows, and prototypes to ensure that the MVPs meet customer needs.
3. Development phase: This phase involves building and testing the MVPs. Using Agile development methodology, the team would work in sprints to deliver working MVPs at regular intervals. Testing and quality assurance would be an integral part of this phase.
4. Deployment phase: In this phase, the MVPs would be released to a small group of users for testing and feedback. Based on this feedback, the team would make any necessary changes and improvements.
5. Launch phase: Once the MVPs have been tested and refined, the application would be launched in the market. This would involve creating marketing materials, promoting the application through various channels, and monitoring user feedback to ensure that the application is meeting customer needs.
6. Growth phase: In this phase, the team would work on improving the application and adding new features based on customer feedback. The focus would be on growing the user base and increasing revenue.

Overall, by following these phases and using Agile development methodology, the team can ensure that the application is developed quickly, meets customer needs, and stands out in the market.

Q.2 You are the DevOps administrator for a project which involves multiple teams who work on multiple platforms (Say Frontend and Backend). Each team has multiple developers, and they all work on dependent modules or on the same files and folders as this is an Agile methodology project and MVP needs to be delivered every single sprint. Considering this scenario, please answer the following questions:

[3 + 3 + 4 = 10 Marks]

a) What are the steps needed to create a GitHub repository for the teams? What kind of security mechanism will you follow to ensure other teams will not be able to access this project?
b) In case there is a problem in a commit pushed by a developer, and you need to build the repo now and you found only during the deployment build, and it is already past midnight, and you are not able to contact the developer, what is the best way to handle this scenario?
c) Two developers are working on the same file. They are touching the same function in the same file. One developer has pushed the code while another developer was committing his change. What kind of issue the second developer will face? Provide the two types of mechanism in which the second developer will fix the issue.

a) To create a GitHub repository for the teams, follow the below steps:

- Create a GitHub account if you do not have one
- Create a new repository and select the appropriate settings, such as the repository name, description, and access type (public/private)
- Add the necessary collaborators to the repository with their appropriate access levels
- Set up a branching strategy that aligns with the project's requirements and ensure each team member is aware of the strategy and the branch they should be working on
- Use git hooks and pre-commit hooks to enforce code quality standards and minimize the risk of committing errors

To ensure the security of the project, it is recommended to follow the below security mechanisms:

- Implement Two-factor authentication (2FA) to protect your account
- Use a strong and complex password for the GitHub account and encourage your team members to do the same
- Enable HTTPS protocol to encrypt data in transit
- Implement Access Control to restrict access to confidential information
- Use encryption to protect sensitive data

b) In case of a problem in a commit pushed by a developer, and the developer is not available, the best way to handle the scenario is to revert the commit that caused the issue. This can be achieved by using the "git revert" command. This will create a new commit that undoes the changes introduced by the faulty commit. Once the revert is completed, a new build and deployment can be triggered.

c) When two developers work on the same file and touch the same function, it is called a merge conflict. The second developer will face a merge conflict issue as Git is not able to merge the two changes automatically. There are two ways the second developer can fix the issue:

d) Manual Merge: In this approach, the second developer can manually merge the changes introduced by both developers. The developer can use a visual merge tool to compare and merge the changes. Once the conflict is resolved, the developer can commit the changes.
e) Rebase: In this approach, the second developer can use the "git rebase" command to reapply their changes after the first developer's changes. This will ensure that the second developer's changes are applied on top of the first developer's changes. Once the rebase is completed, the developer can commit the changes.

Q.3 For eReservHotel application, customer proposed below functionality to be implemented:

Login and Signup page for end users to use the application. Once user gets logged in he/she can reserve the room according to their selection (City, Area, package etc.). User should be provided with the addon service of car hire during their entire stay or pick & drop facility. Rewards and discount should provide as a part of loyalty program. User should be given option to select preferred payment gateway upon completion of hotel reservation process.

Being DevOps architect,

a) Prepare and design application using component-based architecture [2 Marks]
b) Draw the dependency graph pipeline [2 Marks]
c) List the benefits of component-based design [1 Mark]

a) The eReservHotel application can be designed using component-based architecture with the following components:

- User authentication component: This component will handle the login and signup functionality for end users.
- Room reservation component: This component will allow users to select a city, area, and package to reserve a room.
- Car hire component: This component will provide users with the option to hire a car during their stay or arrange for pick and drop services.
- Loyalty program component: This component will manage rewards and discounts for users as part of the loyalty program.
- Payment gateway component: This component will handle the payment process for the hotel reservation.

b) The dependency graph pipeline for the eReservHotel application can be visualized as follows:

User authentication component --> Room reservation component --> Car hire component --> Loyalty program component --> Payment gateway component

c) Benefits of component-based design:

d) Reusability: Components can be reused across different applications, reducing development time and effort.
e) Modularity: Each component can be developed and tested independently, making it easier to maintain and update the application.
f) Scalability: The application can be scaled up or down by adding or removing components as needed.
g) Flexibility: Components can be easily swapped out or updated without affecting the rest of the application.

Q.4 With Traditional Development Elita corporation is able to develop their add-on features in average span of 4 months and 1 month is reserved to make the successful testing and deployment. You been hired as consultant to derive the results by:

a) Identifying the Problem Statement [1 Mark]
b) Proposing solution for optimized testing and deployment [2 Marks]
c) Justify the proposal [2 Marks]

a) Problem Statement:

The traditional development process followed by Elita corporation is taking an average span of 4 months to develop their add-on features, and an additional 1 month for successful testing and deployment. This timeline can lead to delayed product releases, which can result in lost opportunities and a competitive disadvantage.

b) Proposed solution for optimized testing and deployment:

To optimize testing and deployment, Elita corporation should adopt a DevOps culture. DevOps culture promotes collaboration between development and operations teams, enabling faster delivery of products to market. Here are some of the key practices that can help optimize testing and deployment:

1. Continuous Integration (CI): CI helps in automating the build and testing process. Developers can continuously check-in their code changes, which triggers a build and test process to ensure code changes do not break existing functionality. This way, the code is always in a releasable state, and issues are caught early in the development process.
2. Continuous Delivery (CD): CD automates the release process, enabling developers to push new features to production quickly and safely. CD ensures that the release process is streamlined, and the releases are predictable, with little to no downtime.
3. Infrastructure as Code (IaC): IaC enables teams to manage their infrastructure in a code-like way. IaC makes it easy to deploy, configure, and manage environments, leading to faster and more reliable deployments.
4. Automated Testing: Automated testing ensures that the application is thoroughly tested before it is deployed to production. Automated testing can include unit tests, integration tests, and end-to-end tests.

c) Justification of the proposal:

The proposed solution helps Elita corporation optimize their testing and deployment process by adopting DevOps culture. DevOps culture ensures that the development and operations teams work together, leading to faster delivery of products to market. By adopting CI, CD, IaC, and automated testing practices, Elita corporation can ensure that their code is always in a releasable state and is thoroughly tested before it is deployed to production. This way, they can significantly reduce their time to market and remain competitive in the market.

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