

Birla Institute of Technology & Science, Pilani
Work Integrated Learning Programmes Division
First Semester 2022-2023
Comprehensive Examination
(EC-3 Regular)

Course No. : CSI ZG514
Course Title : Introduction to DevOps
Nature of Exam : Open Book
Weightage : 40%
Duration : 2 ½ Hours
Date of Exam : 27/11/2022 (Evening)

No. of Pages = 2 No. of Questions = 4
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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 Jason works in a firm with a small workforce, and he must do a variety of tasks, including coding, building, testing, and deployment. As a result, he is overworked, which is affecting his mental health. Due to personal constraints, he is unable to leave his organization. What kind of automation strategy will he use to solve the aforementioned scenario? Mention the necessary tools and respective file names.

[10 Marks]

Ans

To address Jason's problem of being overworked, he can use an automation strategy that will help him reduce the amount of time he spends on repetitive tasks, allowing him to focus on other important tasks and ultimately improving his mental health. One approach is to implement Continuous Integration and Continuous Deployment (CI/CD) automation using a tool such as Jenkins.

Here are the necessary steps and file names that Jason can use to implement the CI/CD automation strategy:

1. Setup Jenkins: Install Jenkins on a server or a cloud instance. The configuration files that need to be created include jenkins.yml and Jenkinsfile.
2. Define the Build Environment: Define the build environment by creating a Dockerfile that specifies the environment for building, testing, and deploying code. This file should be named Dockerfile.
3. Define the Build Process: Create a Jenkinsfile that describes the build process, including the steps required to build, test, and deploy code. This file should be named Jenkinsfile.
4. Integrate with Version Control: Integrate the build process with version control, such as Git, by creating a webhook that triggers the build process whenever a code change is pushed to the repository.

5. Automate Testing: Automate the testing process by creating a testing script that runs unit tests, integration tests, and other necessary tests. This script should be named test.sh.
6. Automate Deployment: Automate the deployment process by creating a deployment script that deploys the code to the target environment. This script should be named deploy.sh.

By implementing CI/CD automation, Jason can automate his development workflow, reduce the amount of time he spends on repetitive tasks, and improve the quality of his code. This, in turn, can help alleviate his workload and ultimately improve his mental health.

Q.2 Melabo Hitech is one of the pioneer organizations in Product Development since 1987 in North America, they were one of the first to bring the Agile Methodology development among all their competitors in the market, however since the last three years, all their new products releases are struggling even though they have a dedicated team to Develop, Test and Deploy to Production.

To overcome this challenge Melabo Hitech would like to adopt the new technology & tools available in the market and revisit their process improvement, your organization has been hired to help Melabo Hitech to complete its digital transformation and improve its delivery of Products and Features.

Jot down all the challenges you observe here and provide your suggestion and justification to achieve the goal of Melabo Hitech? [10 Marks]

Ans

1. Lack of Adaptability: Melabo Hitech has been using Agile Methodology since 1987, but they seem to have not adapted to the changing technology and tools available in the market.
2. Inefficient Process: Despite having a dedicated team for Development, Testing, and Deployment, the new product releases are struggling. This indicates that their development process may not be efficient.
3. Lack of Innovation: Melabo Hitech seems to have not adopted new technology and tools in their development process, which could limit their ability to innovate and deliver features quickly.
4. Poor Product Quality: The struggle with new product releases indicates that the product quality may not be up to the mark.

Suggestions:

1. Adopt Modern Tools and Technologies: Melabo Hitech should revisit their technology stack and adopt modern tools and technologies that can help

- improve their development process, such as DevOps, cloud computing, containerization, and automation tools.
2. Revamp their Development Process: Melabo Hitech should revamp their development process to improve efficiency and reduce the time to market. This can be achieved through the adoption of Agile Development, DevOps practices, and Continuous Delivery.
 3. Invest in Innovation: Melabo Hitech should invest in innovation by encouraging their teams to experiment with new tools and technologies and adopt a culture of continuous learning. They should also explore emerging technologies such as Artificial Intelligence and Machine Learning to create innovative products and features.
 4. Focus on Product Quality: Melabo Hitech should focus on improving product quality by implementing Quality Assurance processes and automating testing to reduce the number of bugs and issues.

Justification:

By adopting modern tools and technologies and revamping their development process, Melabo Hitech can improve their delivery of products and features. By investing in innovation, they can stay ahead of their competitors and deliver new and innovative products to their customers. Focusing on product quality can help improve customer satisfaction and reduce the number of issues and bugs, thereby improving the overall product experience.

Q.3 Tiger Team has certain concepts that they wish to convert the idea into a working software application.

- (a) Now, as a manager, I'm unsure if I should adopt the Agile or DevOps work cultures. Can you tell me why DevOps is better than Agile? Or vice versa? [3 Marks]
- (b) I am not sure whether Continuous Testing and Automation Testing are the same. Can you explain whether both are the same or not? Justify your answer. [3 Marks]
- (c) The team wanted to keep the Trunk/Mainline (master branch) updated by using forward and reverse update processes. There are two teams developing new features using separate branches. Describe the process the team is using for keeping the Trunk/Mainline updated. [4 Marks]

Ans

a) Whether to adopt Agile or DevOps depends on the specific needs and goals of your team and project. Both methodologies have their advantages and disadvantages. Agile focuses on delivering high-quality products through incremental and iterative development cycles. DevOps, on the other hand, emphasizes collaboration and communication between Development and Operations teams to automate the software delivery process.

Agile is suitable for teams that prioritize speed, flexibility, and adaptability. It's well-suited for projects that require frequent changes and updates. DevOps, on the other hand, is suitable for teams that want to streamline the software delivery process, reduce lead times, and improve product quality.

Ultimately, the decision to adopt Agile or DevOps should be based on your specific needs, goals, and resources. You may even consider adopting a hybrid approach that combines the best of both methodologies.

b) Continuous Testing and Automation Testing are not the same. Automation Testing refers to the process of using automated tools and scripts to execute tests, while Continuous Testing is a practice of executing tests at every stage of the software delivery pipeline. Continuous Testing involves both manual and automated testing.

Automation Testing is a part of Continuous Testing, but it's not the only component. Continuous Testing involves a continuous feedback loop, where testing is done throughout the development cycle, from development to production. This helps teams catch and fix bugs and issues early in the development process, reducing the cost and time of fixing them later.

c) The process for keeping the Trunk/Mainline updated involves using forward and reverse update processes. The teams working on new features should develop and test their features in their separate branches. Once they are ready to merge their changes into the Trunk/Mainline, they should use the forward update process.

In the forward update process, the changes made in the branch are merged into the Trunk/Mainline. This ensures that the Trunk/Mainline stays up to date with the latest changes. Once the changes are merged, the Trunk/Mainline is tested and validated to ensure that it's stable and working as expected.

If any issues or bugs are found in the Trunk/Mainline, the teams can use the reverse update process to fix them. In the reverse update process, the changes made in the Trunk/Mainline

are merged back into the branch. This helps ensure that the branch stays up to date with the latest changes and any issues are fixed before they become bigger problems.

Regenerate response

Q.4 ProcMain Pharmaceutical has recently procured 198 Units of Processors, 1 TB of Memory and 500 TB of Storage, to build their new Data Center. With this capacity, they are expecting to run 1000 Applications which includes Development, QA and Production. What all solutions can help ProcMain to achieve and optimize their utilization of capacity procured? Justify the best solution you think of and how it will work. [7 + 3 Marks]

Ans

There are several solutions that ProcMain can consider to optimize their utilization of the capacity they have procured. Here are a few options:

1. Virtualization: ProcMain can use virtualization technology to create multiple virtual servers on a single physical server, which can help them utilize their capacity more efficiently. By using virtualization, they can consolidate their infrastructure and reduce their hardware and maintenance costs.
2. Cloud Computing: Another solution that ProcMain can consider is using cloud computing services, such as Amazon Web Services (AWS), Microsoft Azure, or Google Cloud Platform (GCP). By using cloud computing, they can leverage the on-demand scalability and pay-as-you-go pricing models to optimize their utilization of resources.
3. Containerization: ProcMain can also consider using containerization technology, such as Docker or Kubernetes, to create and deploy applications in lightweight and portable containers. This can help them improve the efficiency and speed of their application development and deployment processes.

Out of these solutions, I believe that containerization would be the best solution for ProcMain. Containerization can help them achieve better resource utilization, faster deployment, and higher scalability. By using containers, they can run multiple applications on a single server, which can help them optimize their capacity utilization. Containers are lightweight and portable, which means that they can be easily moved between different environments, making it easier to deploy applications to different stages of development, testing, and production.

In addition, containerization can also help ProcMain improve their application security and reliability. Containers provide isolation between applications, which helps to prevent issues with one application from affecting other applications running on the same server. Furthermore, containers can be easily monitored and managed, which helps to ensure that applications are running smoothly and efficiently.

Overall, containerization would be a great solution for ProcMain to optimize their utilization of the capacity they have procured. It can help them improve their resource utilization, application development and deployment processes, and application security and reliability.
