Development Operations
Assignment # 4

MEMBER1 REG#: _____   NAME: _____

MEMBER2 REG#: _____   NAME: _____

COURSE CODE: CS423   INSTRUCTOR: MUHAMMAD SAJID ALI

TOTAL MARKS: Non-Graded

Hands-On Infrastructure Deployment with Terraform

Instructions

The goal of this assignment is to introduce students to infrastructure management using code. Using Terraform, they will create a straightforward setup, establishing a Virtual Private Cloud (VPC) and deploying secure EC2 instances for a basic web server. This hands-on exercise aims to build Terraform skills and familiarize students with managing infrastructure efficiently through code. This will be a group assignment and each group should consist of *two people* only.

Your task is to use **Terraform to deploy a simple web application infrastructure on AWS**. The architecture includes a VPC with two subnets distributed across two Availability Zones. EC2 instances will host a simple web server. Provide a *well-organized terraform project with configurations distributed across multiple files*. Submit all terraform files along with a readme file explaining any specific instructions or considerations for deploying and testing your infrastructure.

Task 1 – IAM User: Create an IAM user named 'terraform-cs423-devops'. Provide console access and assign the Administrator policy to this user. Should generate the user's credentials, as you will include them in your assignment submission for the instructor to use if needed.   (CLO4, PLO5) **(10 marks)**

Task 2 – Networking: Create VPC with following settings: (CLO4, PLO5)**(30 marks)**
   1. VPC named 'devops-assignment-4' with CIDR block of <address of your choice>/16.
   2. Create two pairs of public and private subnets, one in each of two availability zones, with names like 'cs423-devops-public-1' and 'cs423-devops-private-1'. Each subnet should support up to 255 virtual machines.
   3. Create a private route table with a name that starts with the VPC name and is followed by arbitrary text. Ensure that the private subnets are configured to have no access to the internet.
   4. Create an internet gateway to give access to the resources deployed in your created VPC.
   5. You must take other necessary actions if required.

Task 3 – Security Groups: Create a security group to control inbound and outbound traffic for the EC2 instances. Ensure that only necessary ports are open and follow the principle of least privilege. Do not forget that one of the instances will host a simple web server.   (CLO4, PLO5) **(10 marks)**

Task 3 – Key Pair: Create a secure key pair named cs423-assignment4-key. Later you will be attaching this key to the EC2 instances.   (CLO4, PLO5) **(10 marks)**

Task 4 – EC2 Instances: Launch two t2.micro EC2 instances within the previously established VPC. Use the latest Ubuntu Amazon Machine Image (AMI). Assign each instance to a specific subnet based on its intended purpose: configure one for hosting a simple web server such as Apache and the other for deploying a database instance or a simple machine learning model that communicates with the web application. Utilize the user_data.sh script for configuring instances. (CLO4, PLO5) **(30 marks)**

1. Give appropriate name to these instances such as 'Assignment4-EC2-1' etc.
2. You should be able to make a ssh connection to the created EC2 instance (in public subnet) from your local machine using the ssh key pair you created in one of the previous tasks.
3. Make sure a simple web server is running on port 80 after you visit http://<instance-ip>:80

Task 5 – Outputs: Create an output that displays the following: (CLO4, PLO5) **(10 marks)**
1. Public and private IP addresses of the EC2 instances.
2. IAM user details

What to Hand In

1. Please see the instructions section as well.
2. All changes should be made to your *cs423-assignment-4* repository. Add me to this repository as well.
3. Submit a zip file on teams that will contain all terraform files along with a readme file explaining any specific instructions or considerations for deploying and testing your infrastructure.
4. Submit the word document that includes.
   A. Introduction to your deployed infrastructure project
   B. Architecture diagram of infrastructure project