Department of Computer Engineering

Academic Term: JAN-MAY 2022

Class: ***BE COMPUTERS***

Subject Name: ***CLOUD COMPUTING LABORATORY***

Subject Code: CSL803

Practical No:	**06**
Title:	**AWS RDS**
Date of Performance:	**02/02/22**
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Roll No:	**8626**
Name of the Student:	**Divita Phadakale**

Evaluation:

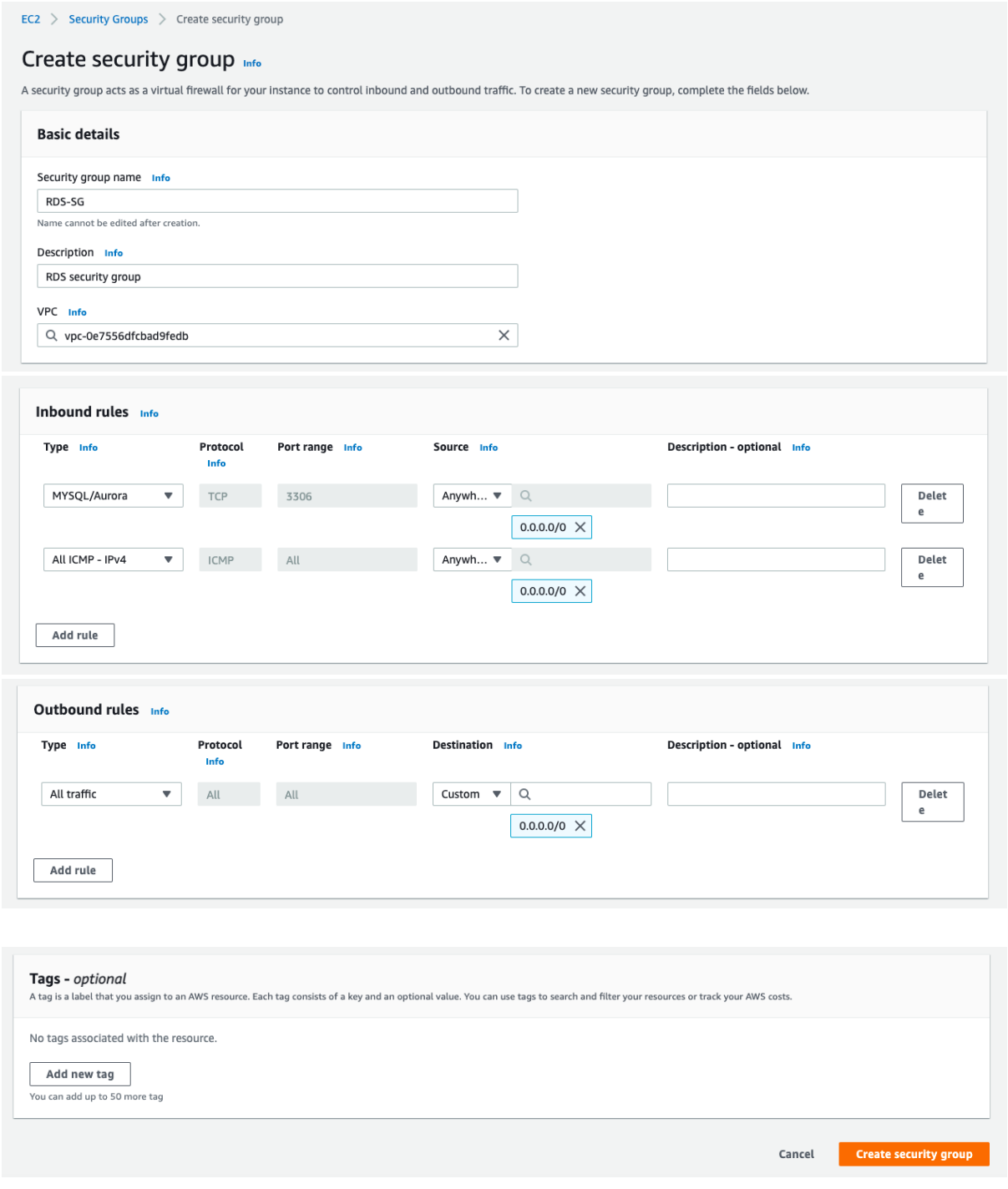
Sr. No	Rubric	Grade
1	On time submission(2)	
2	Preparedness(2)	
3	Output(2)	
4	Post Lab Questions (4)	
	TOTAL	

Signature of the Teacher:

Experiment 6: RDS

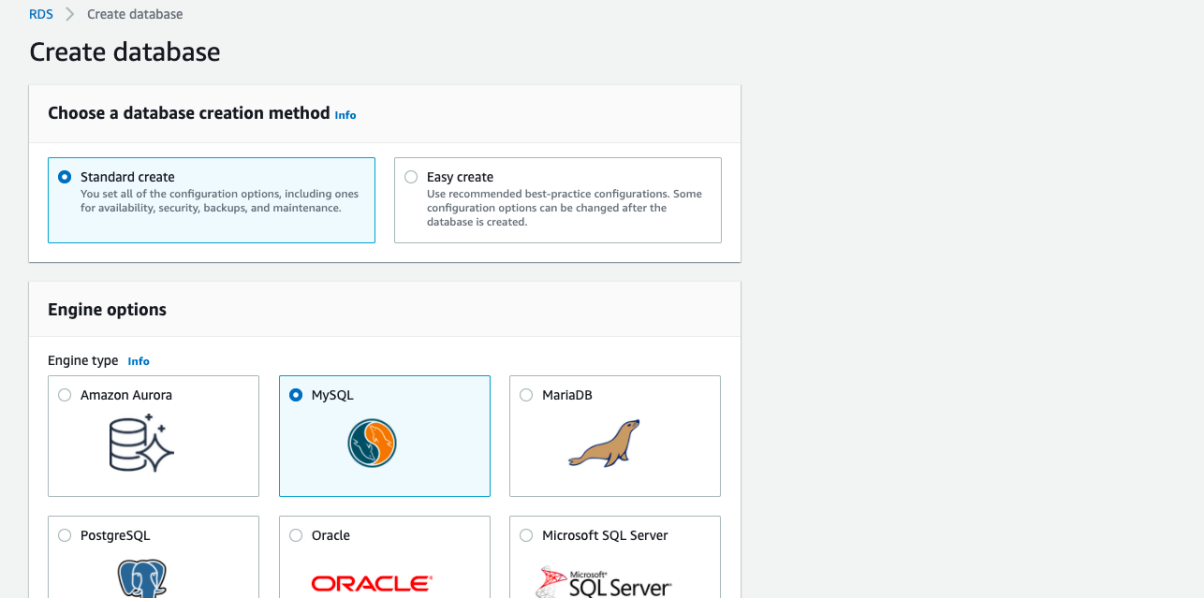
Create Security Group for RDS Instance

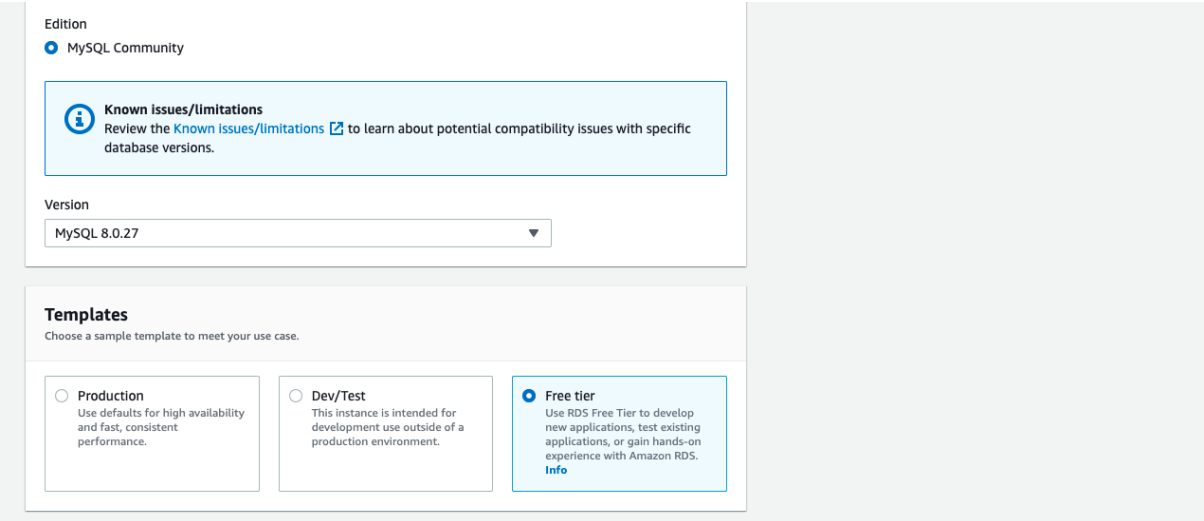
- Click on “Security Groups” in Network & Security and click on CREATE SECURITY GROUP in the right corner.
- Give name and description(optional) to the security group and enter the following inbound and outbound rules.
- Click on “create security group”.

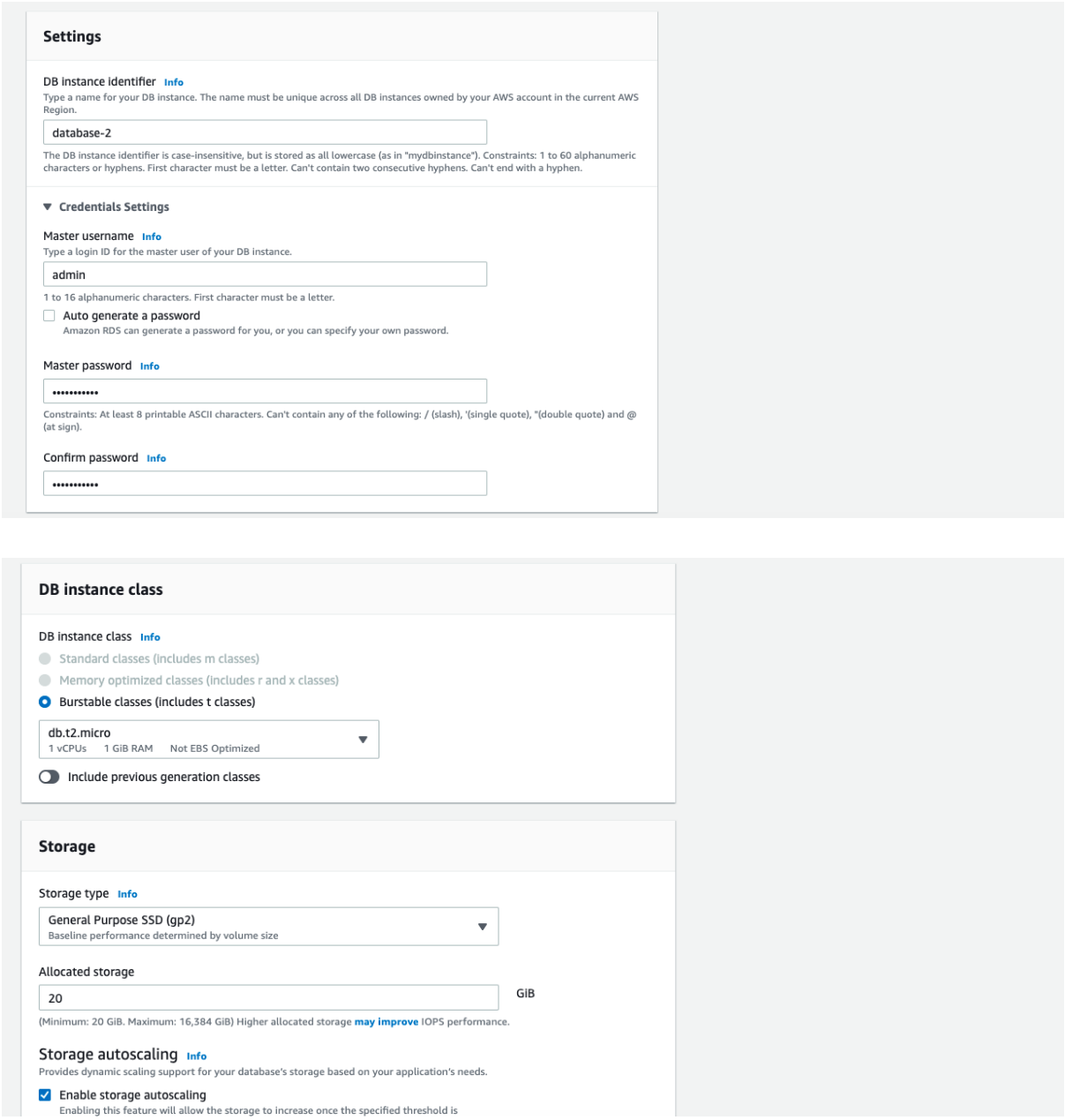


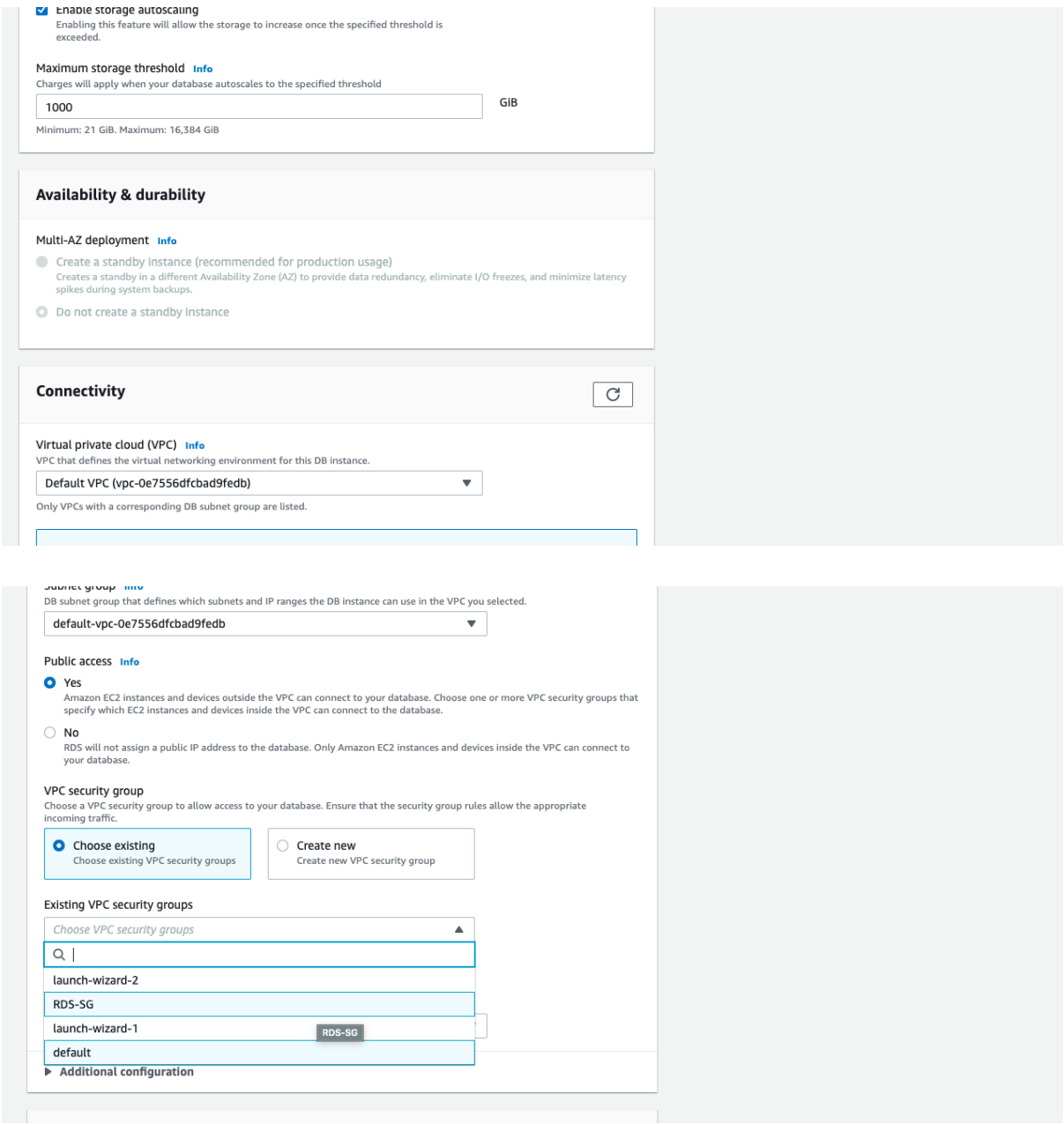
Create Database

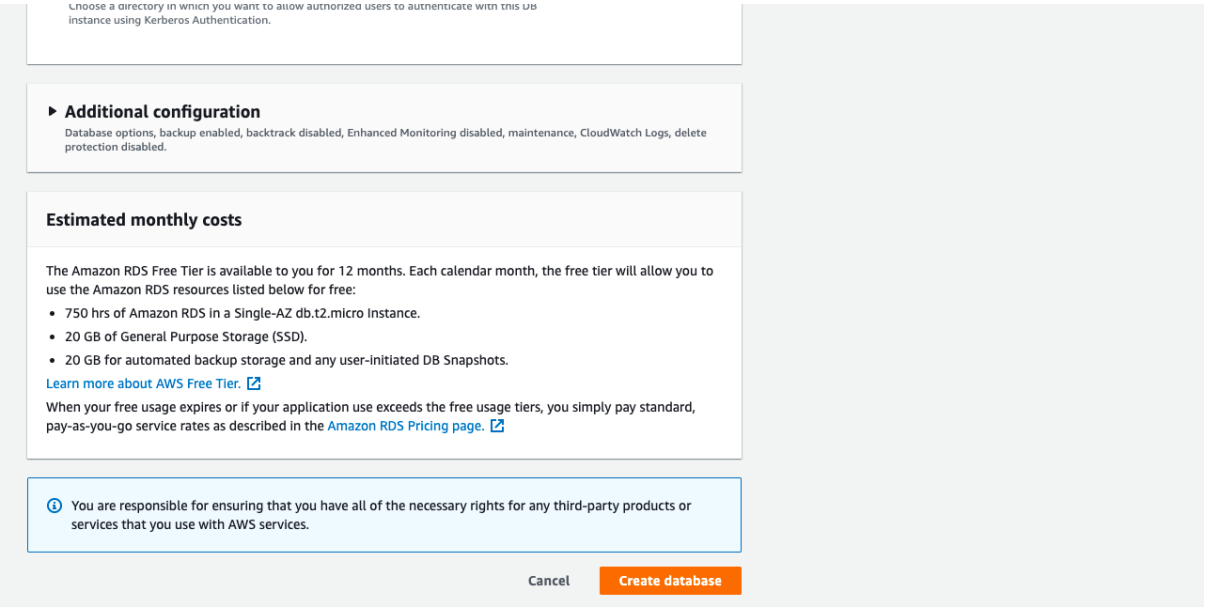
- Navigate to RDS by searching “RDS” and click on Databases on the left side.
- Click on create database.
- Select Mysql in Engine options.
- Select Free tier in Templates.
- Give a name to DB instance identifier or keep it as default.
- Give a master username or keep it as default.
- Create a password and confirm it.
- In the VPC security group select the security group created above(RDS-SG).
- Click on “create database”.





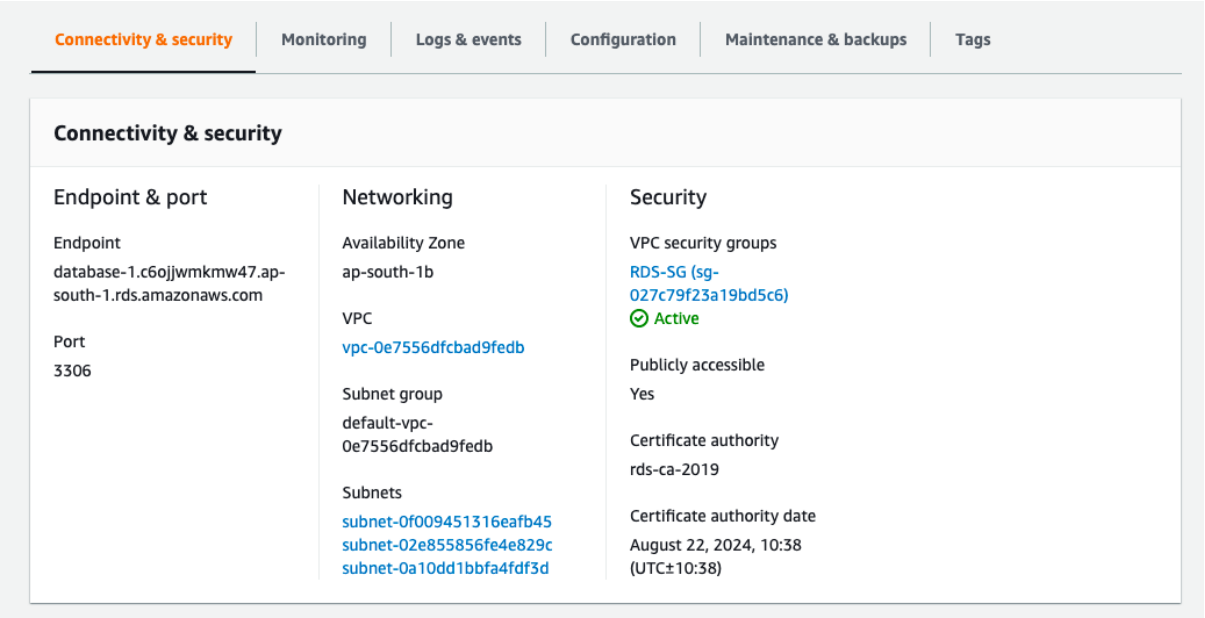

Settings
DB instance identifier Info
Type a name for your DB instance. The name must be unique across all DB instances owned by your AWS account in the current AWS Region.
database-2
The DB instance identifier is case-insensitive, but is stored as all lowercase (as in "mydbinstance"). Constraints: 1 to 60 alphanumeric characters or hyphens. First character must be a letter. Can't contain two consecutive hyphens. Can't end with a hyphen.
Credentials Settings
Master username Info
Type a login ID for the master user of your DB instance.
admin
1 to 16 alphanumeric characters. First character must be a letter.
Auto generate a password
Amazon RDS can generate a password for you, or you can specify your own password.
Master password Info
Constraints: At least 8 printable ASCII characters. Can't contain any of the following: / (slash), '(single quote), "(double quote) and @ (at sign).
Confirm password Info
DB instance class
DB instance class Info
Standard classes (includes m classes)
Memory optimized classes (includes r and x classes)
Burstable classes (includes t classes)
db.t2.micro
1 vCPUs 1 GiB RAM Not EBS Optimized
Include previous generation classes
Storage
Storage type Info
General Purpose SSD (gp2)
Baseline performance determined by volume size
Allocated storage
20
GiB
(Minimum: 20 GiB. Maximum: 16,384 GiB) Higher allocated storage may improve IOPS performance.
Storage autoscaling Info
Provides dynamic scaling support for your database's storage based on your application's needs.
Enable storage autoscaling
Enabling this feature will allow the storage to increase once the specified threshold is


Enable storage autoscaling
Enabling this feature will allow the storage to increase once the specified threshold is exceeded.
Maximum storage threshold Info
Charges will apply when your database autoscales to the specified threshold
1000
GiB
Minimum: 21 GiB. Maximum: 16,384 GiB
Availability & durability
Multi-AZ deployment Info
Create a standby instance (recommended for production usage)
Creates a standby in a different Availability Zone (AZ) to provide data redundancy, eliminate I/O freezes, and minimize latency spikes during system backups.
Do not create a standby instance
Connectivity
Virtual private cloud (VPC) Info
VPC that defines the virtual networking environment for this DB instance.
Default VPC (vpc-0e7556dfcbad9fedb)
Only VPCs with a corresponding DB subnet group are listed.
DB subnet group that defines which subnets and IP ranges the DB instance can use in the VPC you selected.
default-vpc-0e7556dfcbad9fedb
Public access Info
Yes
Amazon EC2 instances and devices outside the VPC can connect to your database. Choose one or more VPC security groups that specify which EC2 instances and devices inside the VPC can connect to the database.
No
RDS will not assign a public IP address to the database. Only Amazon EC2 instances and devices inside the VPC can connect to your database.
VPC security group
Choose a VPC security group to allow access to your database. Ensure that the security group rules allow the appropriate incoming traffic.
Choose existing
Choose existing VPC security groups
Create new
Create new VPC security group
Existing VPC security groups
Choose VPC security groups
launch-wizard-2
RDS-SG
launch-wizard-1
default
RDS-SG
Additional configuration



Connect to Database

- Click on the database you created and under Connectivity & Security copy the endpoint.



- Connect to your public EC2 instance through SSH or putty and switch to root user.

```
praditirede@Praditis-MacBook-Air ~ % cd Downloads
praditirede@Praditis-MacBook-Air Downloads % chmod 400 server.pem
praditirede@Praditis-MacBook-Air Downloads % ssh -i "server.pem" ec2-user@ec2-13
-233-123-183.ap-south-1.compute.amazonaws.com
Last login: Sun Feb 13 15:12:06 2022 from 106.220.158.144

       __|  __|_  )
       _|  (     /   Amazon Linux 2 AMI
      ___|\___|___|

https://aws.amazon.com/amazon-linux-2/
5 package(s) needed for security, out of 8 available
Run "sudo yum update" to apply all updates.
-bash: warning: setlocale: LC_CTYPE: cannot change locale (UTF-8): No such file
or directory
[[ec2-user@ip-172-31-40-167 ~]$ sudo su
```

- Run Command
  mysql -h (paste the endpoint copied above) -u (master username of the database created above) -p
- Enter the password when prompted.

```
[[root@ip-172-31-40-167 ec2-user]# mysql -h database-1.c6ojjwmkmw47.ap-south-1.rd
s.amazonaws.com -u admin -p
Enter password:
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MySQL connection id is 9
Server version: 8.0.27 Source distribution

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.
```

Database is connected successfully.

- Run commands like
  show databases;
  create database *dbname;*
  use *dbname*;
  show tables;
  etc. to use the database.

```
MySQL [(none)]> show databases;
+--------------------+
| Database           |
+--------------------+
| information_schema |
| mysql              |
| performance_schema |
| sys                |
+--------------------+
4 rows in set (0.03 sec)
```

```
MySQL [(none)]> create database sample;
Query OK, 1 row affected (0.01 sec)

MySQL [(none)]> show databases;
+--------------------+
| Database           |
+--------------------+
| information_schema |
| mysql              |
| performance_schema |
| sample             |
| sys                |
+--------------------+
5 rows in set (0.00 sec)
```

```
MySQL [(none)]> use sample;
Database changed
MySQL [sample]> show tables;
Empty set (0.00 sec)
```

```
MySQL [sample]> create table sampletable(a int, b int);
Query OK, 0 rows affected (0.02 sec)

MySQL [sample]> show tables;
+------------------+
| Tables_in_sample |
+------------------+
| sampletable      |
+------------------+
1 row in set (0.00 sec)

MySQL [sample]>
```

Post Lab Questions:

1. What are the benefits of using Amazon AWS RDS system?

Easy Deployment

Amazon RDS allows you to use either the AWS Management Console or a set of APIs to create, delete, and modify your database instances. You have full control of access and security for your instances, as well as an easy process to manage your database backups and snapshots.

Amazon RDS for MySQL instances are pre-configured with parameters and settings tuned for the instance type you have chosen. Fear not, however, as you have a massive amount of control over these parameters with easy to manage database parameter groups that provide granular control and tuning options for your database instances.

Fast Storage Options

Amazon RDS provides two SSD-backed storage options for your database instances. The General Purpose storage option provides cost-effective storage for smaller or medium-sized workloads. For those applications that demand higher performance (such as heavy OLTP workloads), Provisioned IOPS Storage delivers consistent storage performance of up to 40,000 I/O's per second.

Easily expandable as your storage requirements grow, you can provision additional storage on the fly with no downtime.

Backup & Recovery

A good DBA is only as good as their last backup. This is a saying I've heard ever since I started working with MySQL back in the 3.2.3 days. It was true then, and it is true now – without the data, what can even the best DBA do to restore production services?

With Amazon RDS, the automated backup features enable backup and recovery of your MySQL database instances to any point in time within your specified retention periods (up to 35 days). You can also manually initiate backups of your instances, and all of these backups will be stored by Amazon RDS until you explicitly delete them. Backups have never been so easy.

High Availability

On-premise high availability is often a challenge, as so many pieces of the puzzle need to work together in unison, and this is discounting the need for multiple data centers that are geographically separated.

Using Amazon RDS Multi-AZ deployments, you can achieve enhanced availability and durability for your MySQL database instances, making them a great fit for production database workloads. By using Amazon RDS Read Replicas, it is easy to elastically scale out beyond the capacity constraints of a single database instance for read-heavy workloads.

Monitoring/Metrics

With the available RDS monitoring features in Amazon Cloudwatch, all of the metrics for your RDS database instances are available at no additional charge. Should you want more detailed and in-depth monitoring options, CloudWatch Enhanced Monitoring provides access to over 50 CPU, memory, file system, and disk I/O metrics.

You can view key operational metrics directly within the AWS Management Console, including compute, memory, storage capacity utilization, I/O activity, instance connections, and more. Never be caught off guard again by not knowing what is happening within your database stack.

Security

As a managed service, Amazon RDS provides a high level of security for your MySQL databases. These include network isolation using Amazon VPC (virtual private cloud), encryption at rest using keys that you create and control through the AWS Key Management Service (KMS). Data can also be encrypted through the wire in transit using SSL.

This is a good point to mention the Shared Responsibility Model, as there are still components you'll need to secure during your RDS setup.

Q2. Explain any use case for AWS RDS system

Use Cases and Deployment Scope

Previously we were using other SQL databases like MySQL or MSSQL on the same server where the application was hosted. As time passed and the size of the database increased, the performance of the application decreased, because of constantly increasing database size. Then we came to know Amazon Relational Database Service (RDS) provides the best possible solution to resolve database size and performance issues, no matter how much data in your database contains.

Q3. What are instances in Amazon EC2?

An Amazon EC2 instance is **a virtual server in Amazon's Elastic Compute Cloud (EC2) for running applications on the Amazon Web Services (AWS) infrastructure**.

Q4. What are AMIs in Amazon EC2?

An Amazon Machine Image (AMI) is **a special type of virtual appliance that is used to create a virtual machine within the Amazon Elastic Compute Cloud ("EC2")**. It serves as the basic unit of deployment for services delivered using EC2.

Q5. What are the features of Amazon Database?

Amazon RDS Features

- Lower administrative burden. Easy to use. ...
- Performance. General Purpose (SSD) Storage. ...
- Scalability. Push-button compute scaling. ...
- Availability and durability. Automated backups. ...
- Security. Encryption at rest and in transit. ...
- Manageability. Monitoring and metrics. ...
- Cost-effectiveness. Pay only for what you use.

Q6. Which of the AWS DB services is a NoSQL database and server-less, and delivers consistent single-digit millisecond latency at any scale?

1. Amazon Aurora
2. MariaDB
3. DynamoDB
4. Amazon Redshift

Ans

Amazon DynamoDB

Amazon DynamoDB is designed to provide consistent single-digit millisecond latency for any scale of workloads.

Q7. What is DynamoDB?

Amazon DynamoDB is a fully managed NoSQL database service that provides fast and predictable performance with seamless scalability. DynamoDB lets you offload the administrative burdens of operating and scaling a distributed database so that you don't have to worry about hardware provisioning, setup and configuration, replication, software patching, or cluster scaling. DynamoDB also offers encryption at rest, which eliminates the operational burden and complexity involved in protecting sensitive data. For more information, see DynamoDB Encryption at Rest.

With DynamoDB, you can create database tables that can store and retrieve any amount of data and serve any level of request traffic. You can scale up or scale down your tables' throughput capacity without downtime or performance degradation. You can use the AWS Management Console to monitor resource utilization and performance metrics.

Q8. How is Security implemented in Amazon RDS?

1. Security of the platform (AWS CLOUD PLATFORM)

Ensuring the security of the whole platform is entirely AWS service provider's duty. In other words we can say that, ultimately AWS manages as well as protects the platform, so that all the services can run on it securely without any interruption. Also for periodical health checks of the cloud platform along with the services running on it, AWS hires third party auditors which regularly test and verify the productivity of our security model as it is the part of the AWS compliance program. These tests provide us a regular report about how secure our platform is. If something is found inappropriate, the security model alarms the service providers about it.

2. Security in the cloud (Your account)

Now, comes the part where the responsibility of security belongs to the users. Basically the users can be categorized into two types.

- **Root user**
- **IAM user or Identity and Access Management user.**

There can only be a single root user of any particular AWS account and IAM user can be multiple in numbers. By default, all the security concerns of an account reside in the hands of the root user. It depends on the root user whether to assign security related authorities to an IAM user or not. Root users can restrict access of any IAM user at any point of time as per their choices. We can use Amazon RDS encryption to make our Database Instances and Snapshots i.e. backups more secured. This encryption algorithm simply convert your data into an inaccessible format when other unauthorized users are trying to access it.

Amazon RDS- Security & Compliance gives us another firm reason to opt AWS as our go-to cloud platform for using all the desired services and databases flexibilities