Superset ID: 6364957

Web API Solution with .NET 9

Exercise 1: First Web API Using .NET Core

Step 1: Creating a New Web API Project

```
cd C:\Users\KIIT\OneDrive\Desktop\Web-Api
dotnet new webapi -n MyFirstWebAPI --use-controllers
cd MyFirstWebAPI
dotnet run
```

Step 2: Understanding the Default Structure

Key files created:

- `Program.cs`: Entry point and configuration.
- `Controllers/WeatherForecastController.cs`: Sample controller.
- `WeatherForecast.cs`: Model class.

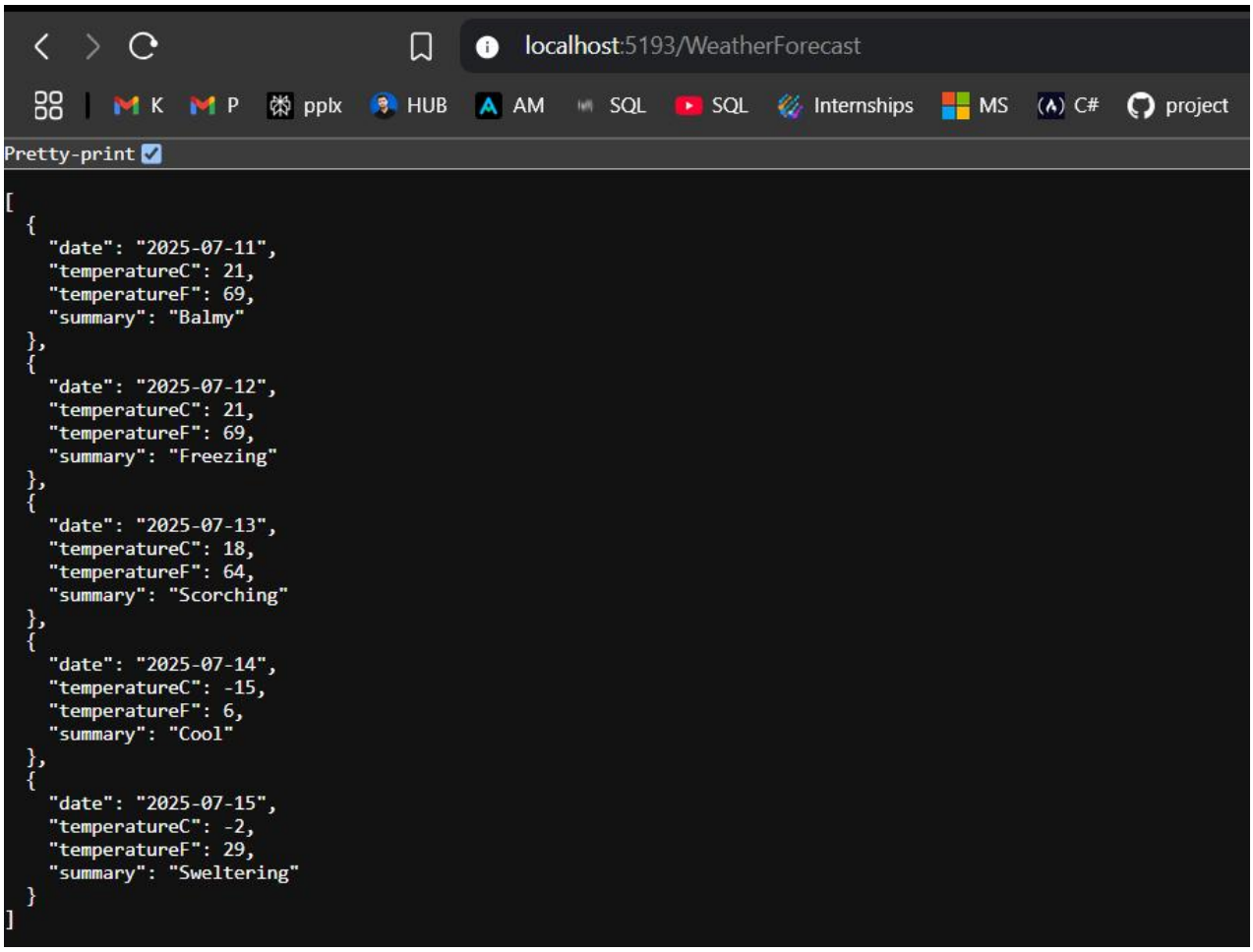
Step 3: Testing the Default API

1. Running `dotnet run`.

```
PS C:\Users\KIIT\OneDrive\Desktop\Web-Api> cd .\MyFirstWebAPI\
PS C:\Users\KIIT\OneDrive\Desktop\Web-Api\MyFirstWebAPI> dotnet run
Using launch settings from C:\Users\KIIT\OneDrive\Desktop\Web-Api\MyFirstWebAPI\Properties\launchSettings.json...
Building...
info: Microsoft.Hosting.Lifetime[14]
      Now listening on: http://localhost:5193
info: Microsoft.Hosting.Lifetime[0]
      Application started. Press Ctrl+C to shut down.
info: Microsoft.Hosting.Lifetime[0]
      Hosting environment: Development
info: Microsoft.Hosting.Lifetime[0]
      Content root path: C:\Users\KIIT\OneDrive\Desktop\Web-Api\MyFirstWebAPI
```

2. Running http://localhost:5193/WeatherForecast (JSON response as oputput) :

Output:



Exercise 2: Web API with Swagger

Step 1: Installing Swagger Package

```
dotnet add package Swashbuckle.AspNetCore
```

Step 2: Configuring Swagger in Program.cs

Replacing the content of `Program.cs` with:

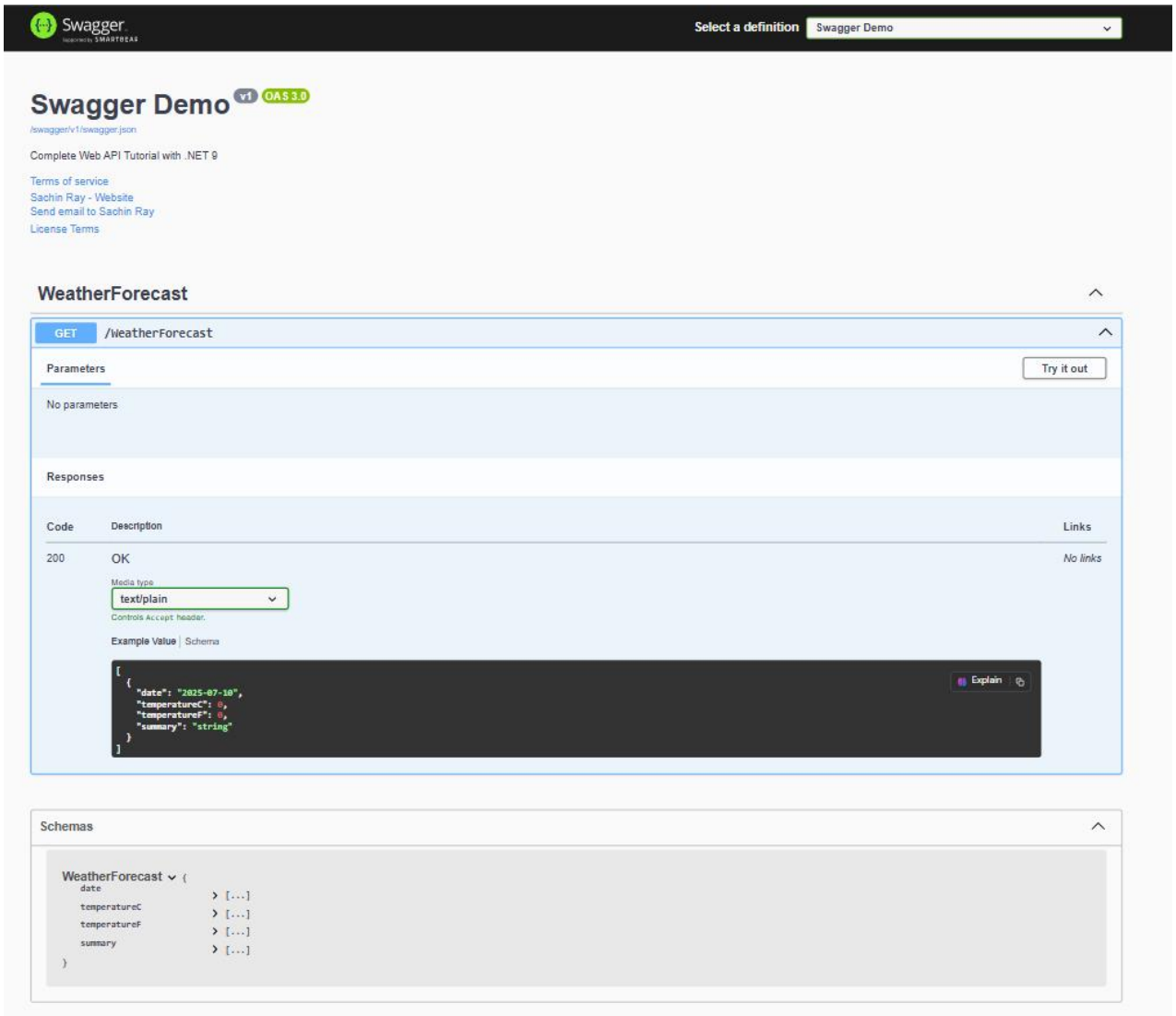
```
using Microsoft.OpenApi.Models;

var builder = WebApplication.CreateBuilder(args);

builder.Services.AddControllers();
builder.Services.AddEndpointsApiExplorer();
builder.Services.AddSwaggerGen(c =>
```

```
{
    c.SwaggerDoc("v1", new OpenApiInfo
    {
        Title = "Swagger Demo",
        Version = "v1",
        Description = "TBD",
        TermsOfService = new Uri("https://example.com/terms"),
        Contact = new OpenApiContact
        {
            Name = "Sachin Ray\\",
            Email = "sachin@xyzmail.com",
            Url = new Uri("https://www.example.com")
        },
        License = new OpenApiLicense
        {
            Name = "License Terms",
            Url = new Uri("https://www.example.com")
        }
    });
});

var app = builder.Build();

if (app.Environment.IsDevelopment())
{
    app.UseSwagger();
    app.UseSwaggerUI(c =>
    {
        c.SwaggerEndpoint("/swagger/v1/swagger.json", "Swagger Demo");
    });
}

app.UseHttpsRedirection();
app.UseAuthorization();
app.MapControllers();

app.Run();
```

Step 3: Testing Swagger

- Run `dotnet run`.
- Visiting http://localhost:5193/swagger to view the Swagger UI with API documentation.

Output:

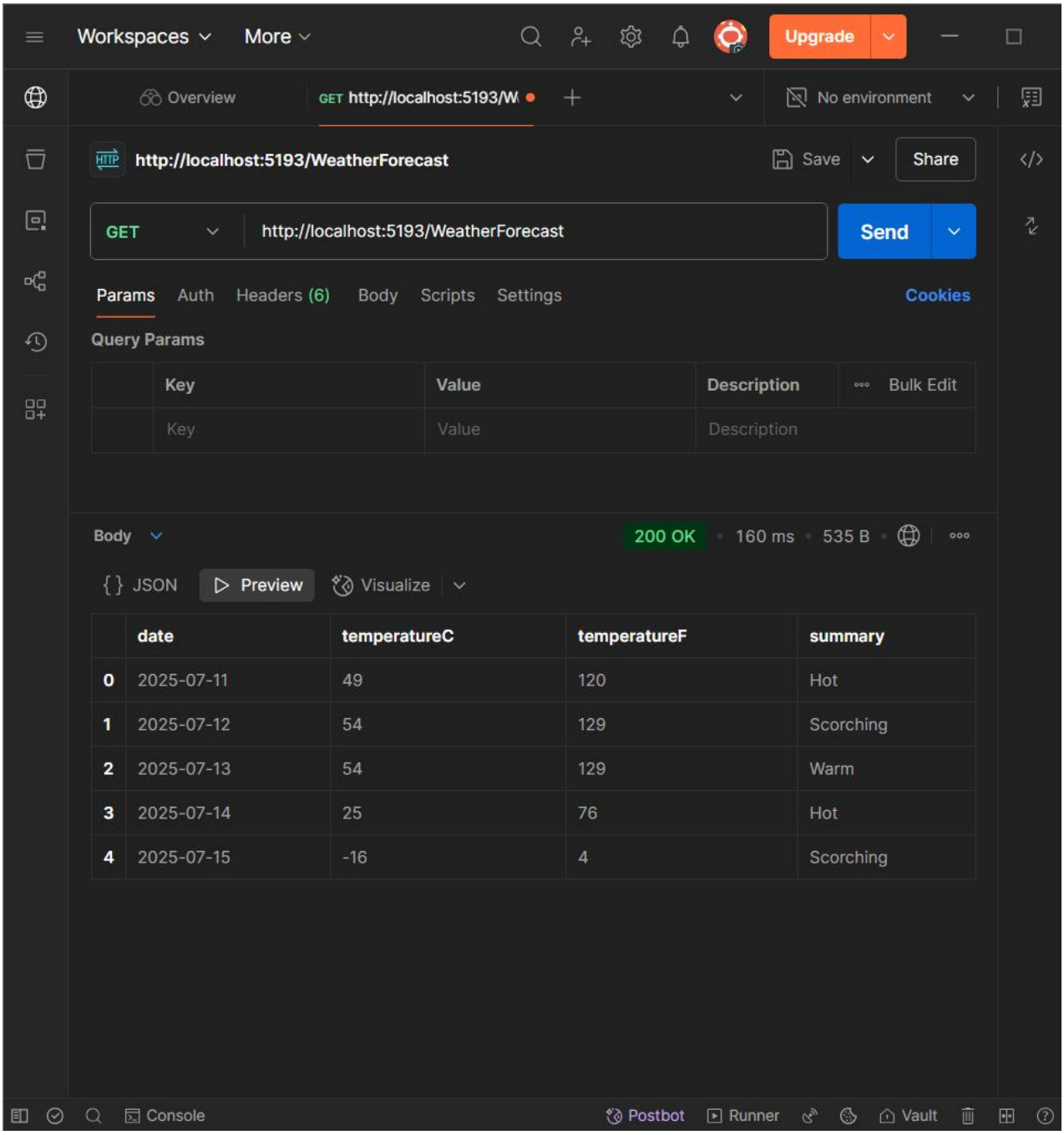


Step 4: Testing with Postman

- Create a new GET request to http://localhost:5193/WeatherForecast.

- Clicking Send;

  Response:



Step 5: Modifying Controller Route

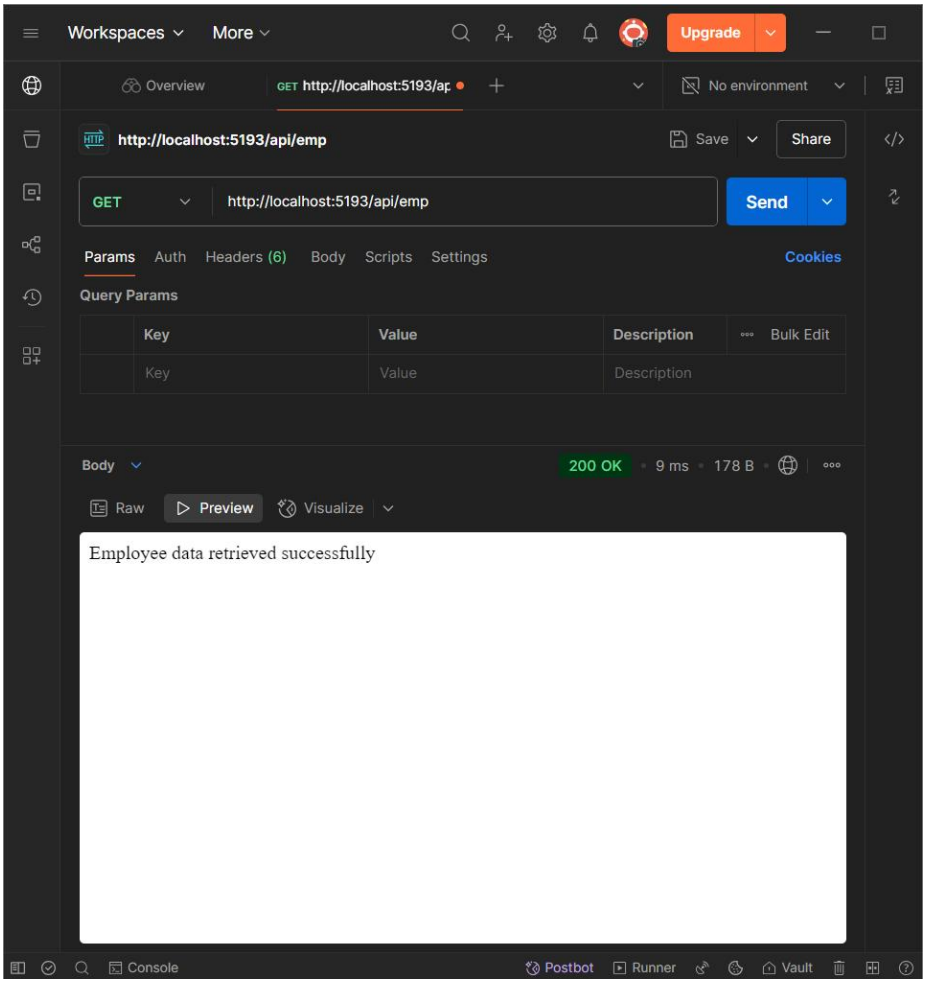
Createing `Controllers/EmployeeController.cs`:

```
using Microsoft.AspNetCore.Mvc;
```

```
namespace MyFirstWebAPI.Controllers
{
   [ApiController]
   [Route("api/[controller]")]
   public class EmployeeController : ControllerBase
   {
      [HttpGet]
      public ActionResult<string> Get()
      {
         return Ok("Employee data retrieved successfully");
      }
   }
}
```

- Changing the route by modify the `Route` attribute to `[Route("api/Emp")]` and testing in Postman after running freshly.

Output:



Exercise 3: Custom Model Class and Filters

1. Creating Models Folder and Classes

2.1 Creating the Models Folder

```
mkdir Models
```

2.2 Adding Employee.cs Model

Create `Models/Employee.cs` with the following content:

```
namespace MyFirstWebAPI.Models
{
    public class Employee
    {
        public int Id { get; set; }
        public string Name { get; set; } = string.Empty;
        public int Salary { get; set; }
        public bool Permanent { get; set; }
        public Department Department { get; set; } = new Department();
        public List<Skill> Skills { get; set; } = new List<Skill>();
        public DateTime DateOfBirth { get; set; }
    }

    public class Department
    {
        public int Id { get; set; }
        public string Name { get; set; } = string.Empty;
    }

    public class Skill
    {
        public int Id { get; set; }
        public string Name { get; set; } = string.Empty;
    }
}
```

3. Updating Employee Controller with Custom Models

3.1 Replace EmployeeController.cs

Overwriting `Controllers/EmployeeController.cs` with:

```
using Microsoft.AspNetCore.Mvc;
using MyFirstWebAPI.Models;

namespace MyFirstWebAPI.Controllers
{
    [ApiController]
    [Route("api/[controller]")]
    public class EmployeeController : ControllerBase
    {
        private static List<Employee> _employees = new List<Employee>();

        public EmployeeController()
        {
            if (_employees.Count == 0)
            {
                _employees = GetStandardEmployeeList();
            }
        }

        [HttpGet]
        [ProducesResponseType(typeof(List<Employee>), 200)]
        public ActionResult<List<Employee>> Get()
        {
            return Ok(_employees);
        }

        [HttpGet("{id}")]
        [ProducesResponseType(typeof(Employee), 200)]
        [ProducesResponseType(404)]
        public ActionResult<Employee> Get(int id)
        {
            var employee = _employees.FirstOrDefault(e => e.Id == id);
            if (employee == null)
                return NotFound($"Employee with ID {id} not found");
            return Ok(employee);
        }

        [HttpPost]
        [ProducesResponseType(typeof(Employee), 201)]
        [ProducesResponseType(400)]
        public ActionResult<Employee> Post([FromBody] Employee employee)
```

```
    {
        if (employee == null)
            return BadRequest("Employee data is required");

        employee.Id = _employees.Count > 0 ? _employees.Max(e => e.Id) + 1 : 1;
        _employees.Add(employee);
        return CreatedAtAction(nameof(Get), new { id = employee.Id }, employee);
    }

    private List<Employee> GetStandardEmployeeList()
    {
        return new List<Employee>
        {
            new Employee
            {
                Id = 1,
                Name = "John Doe",
                Salary = 50000,
                Permanent = true,
                Department = new Department { Id = 1, Name = "IT" },
                Skills = new List<Skill> { new Skill { Id = 1, Name = "C#" }, new Skill { Id = 2, Name = "ASP.NET" } },
                DateOfBirth = new DateTime(1990, 1, 1)
            },
            new Employee
            {
                Id = 2,
                Name = "Jane Smith",
                Salary = 60000,
                Permanent = false,
                Department = new Department { Id = 2, Name = "HR" },
                Skills = new List<Skill> { new Skill { Id = 3, Name = "Management" }, new Skill { Id = 4, Name =
"Communication" } },
                DateOfBirth = new DateTime(1985, 5, 15)
            },
            new Employee
            {
                Id = 3,
                Name = "Bob Johnson",
                Salary = 55000,
                Permanent = true,
                Department = new Department { Id = 1, Name = "IT" },
                Skills = new List<Skill> { new Skill { Id = 5, Name = "JavaScript" }, new Skill { Id = 6, Name = "React" } },
                DateOfBirth = new DateTime(1988, 12, 10)
            }
        };
```

```
    }
  }
}
```

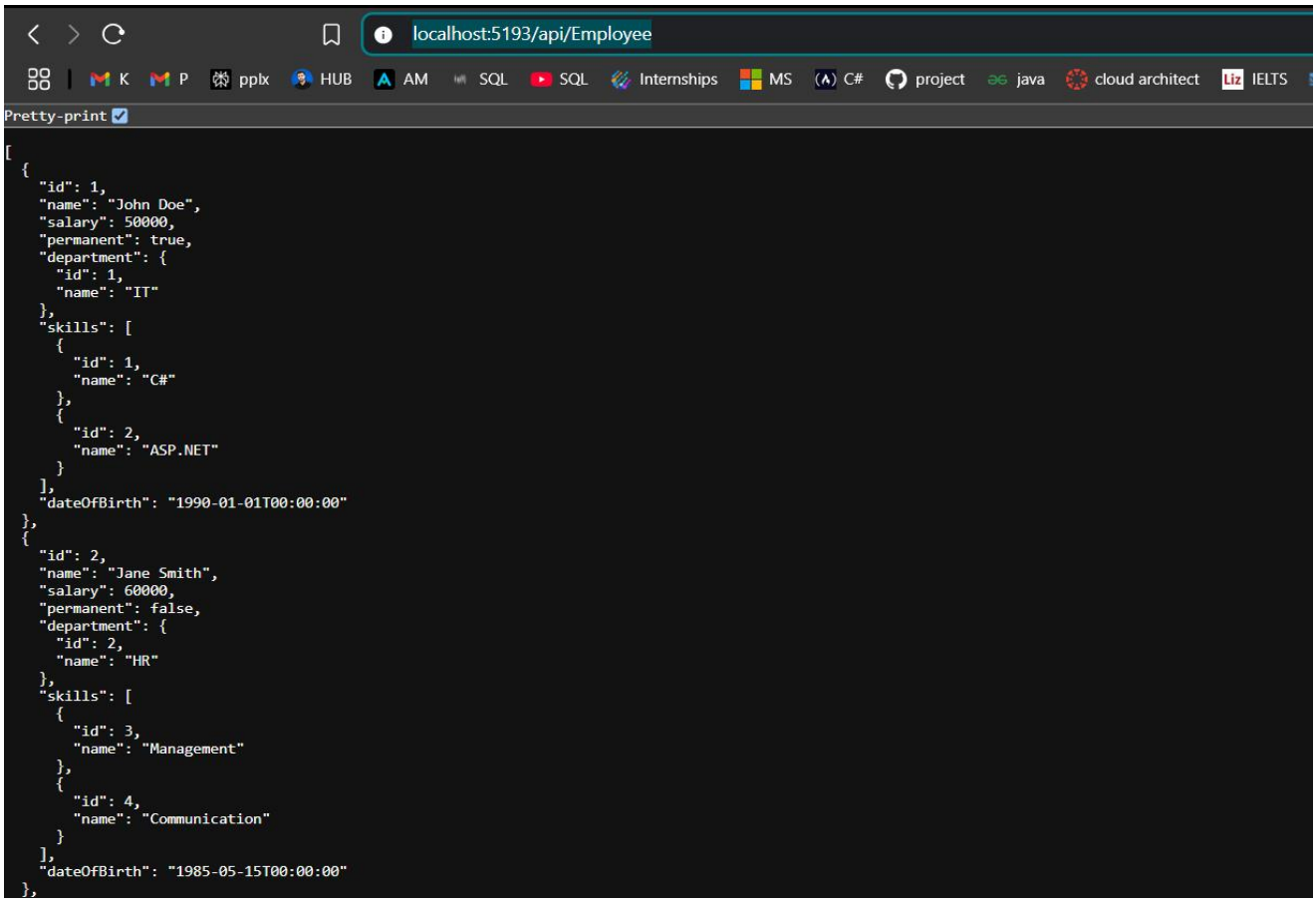
4. Test Custom Models

4.1 Build and Run

```
dotnet build
dotnet run
```

4.2 Testing in Browser

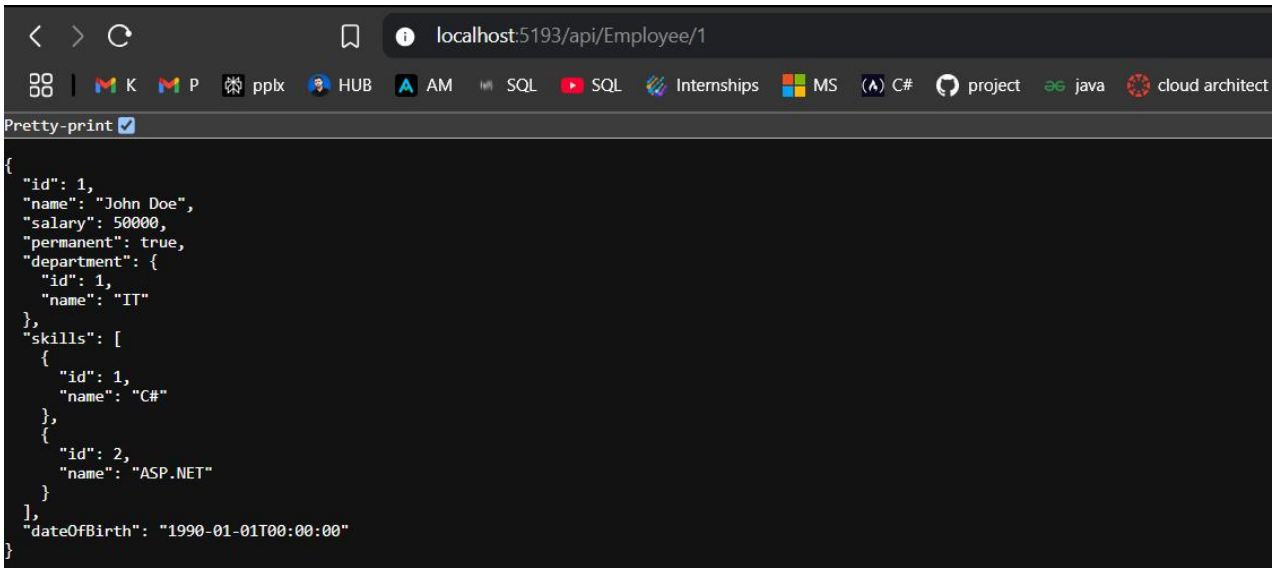
3. Going to: `http://localhost:5193/api/Employee`
4. **Output:**



```
  {
    "id": 3,
    "name": "Bob Johnson",
    "salary": 55000,
    "permanent": true,
    "department": {
      "id": 1,
      "name": "IT"
    },
    "skills": [
      {
        "id": 5,
        "name": "JavaScript"
      },
      {
        "id": 6,
        "name": "React"
      }
    ],
    "dateOfBirth": "1988-12-10T00:00:00"
  }
]
```


4.3 Testing Single Employee

- Going to: http://localhost:5193/api/Employee/1
- **Output:**




```
{
  "id": 1,
  "name": "John Doe",
  "salary": 50000,
  "permanent": true,
  "department": {
    "id": 1,
    "name": "IT"
  },
  "skills": [
    {
      "id": 1,
      "name": "C#"
    },
    {
      "id": 2,
      "name": "ASP.NET"
    }
  ],
  "dateOfBirth": "1990-01-01T00:00:00"
}
```


5. Create Custom Auth Filter

5.1 Creating Filters Folder

```
mkdir Filters
```

5.2 Adding CustomAuthFilter.cs

Creating `Filters/CustomAuthFilter.cs`:

```
using Microsoft.AspNetCore.Mvc;
using Microsoft.AspNetCore.Mvc.Filters;

namespace MyFirstWebAPI.Filters
{
    public class CustomAuthFilter : ActionFilterAttribute
    {
        public override void OnActionExecuting(ActionExecutingContext context)
        {
            var request = context.HttpContext.Request;

            if (!request.Headers.ContainsKey("Authorization"))
            {
                context.Result = new BadRequestObjectResult("Invalid request - No Auth token");
                return;
            }

            var authHeader = request.Headers["Authorization"].ToString();
            if (!authHeader.Contains("Bearer", StringComparison.OrdinalIgnoreCase))
            {
                context.Result = new BadRequestObjectResult("Invalid request - Token present but Bearer unavailable");
                return;
            }

            base.OnActionExecuting(context);
        }
    }
}
```

6. Appling Custom Auth Filter

6.1 Updating EmployeeController.cs

Final code:

```
using Microsoft.AspNetCore.Mvc;

using MyFirstWebAPI.Models;

using MyFirstWebAPI.Filters;



namespace MyFirstWebAPI.Controllers

{
```

```
[CustomAuthFilter]
[ApiController]
[Route("api/[controller]")]
public class EmployeeController : ControllerBase
{
    private static List<Employee> _employees = new List<Employee>();

    public EmployeeController()
    {
        if (_employees.Count == 0)
        {
            _employees = GetStandardEmployeeList();
        }
    }

    [HttpGet]
    [ProducesResponseType(typeof(List<Employee>), 200)]
    public ActionResult<List<Employee>> Get()
    {
        return Ok(_employees);
    }

    [HttpGet("{id}")]
    [ProducesResponseType(typeof(Employee), 200)]
    [ProducesResponseType(404)]
    public ActionResult<Employee> Get(int id)
    {
        var employee = _employees.FirstOrDefault(e => e.Id == id);
        if (employee == null)
            return NotFound($"Employee with ID {id} not found");
        return Ok(employee);
    }
```

```
[HttpPost]
[ProducesResponseType(typeof(Employee), 201)]
[ProducesResponseType(400)]
public ActionResult<Employee> Post([FromBody] Employee employee)
{
    if (employee == null)
        return BadRequest("Employee data is required");

    employee.Id = _employees.Count > 0 ? _employees.Max(e => e.Id) + 1 : 1;
    _employees.Add(employee);
    return CreatedAtAction(nameof(Get), new { id = employee.Id }, employee);
}

private List<Employee> GetStandardEmployeeList()
{
    return new List<Employee>
    {
        new Employee
        {
            Id = 1,
            Name = "John Doe",
            Salary = 50000,
            Permanent = true,
            Department = new Department { Id = 1, Name = "IT" },
            Skills = new List<Skill> { new Skill { Id = 1, Name = "C#" }, new Skill { Id = 2, Name = "ASP.NET" } },
            DateOfBirth = new DateTime(1990, 1, 1)
        },
        new Employee
        {
            Id = 2,
            Name = "Jane Smith",
```

```
                Salary = 60000,
                Permanent = false,
                Department = new Department { Id = 2, Name = "HR" },
                Skills = new List<Skill> { new Skill { Id = 3, Name = "Management" }, new Skill { Id = 4, Name =
"Communication" } },
                DateOfBirth = new DateTime(1985, 5, 15)
            },
            new Employee
            {
                Id = 3,
                Name = "Bob Johnson",
                Salary = 55000,
                Permanent = true,
                Department = new Department { Id = 1, Name = "IT" },
                Skills = new List<Skill> { new Skill { Id = 5, Name = "JavaScript" }, new Skill { Id = 6, Name = "React" } },
                DateOfBirth = new DateTime(1988, 12, 10)
            }
        };
    }
  }
}
```

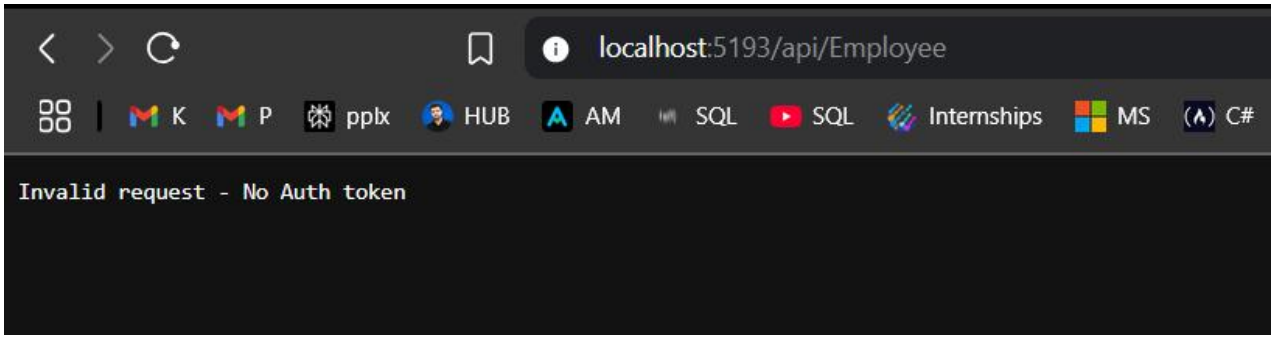
7. Testing Custom Auth Filter:

Once again building and runnning

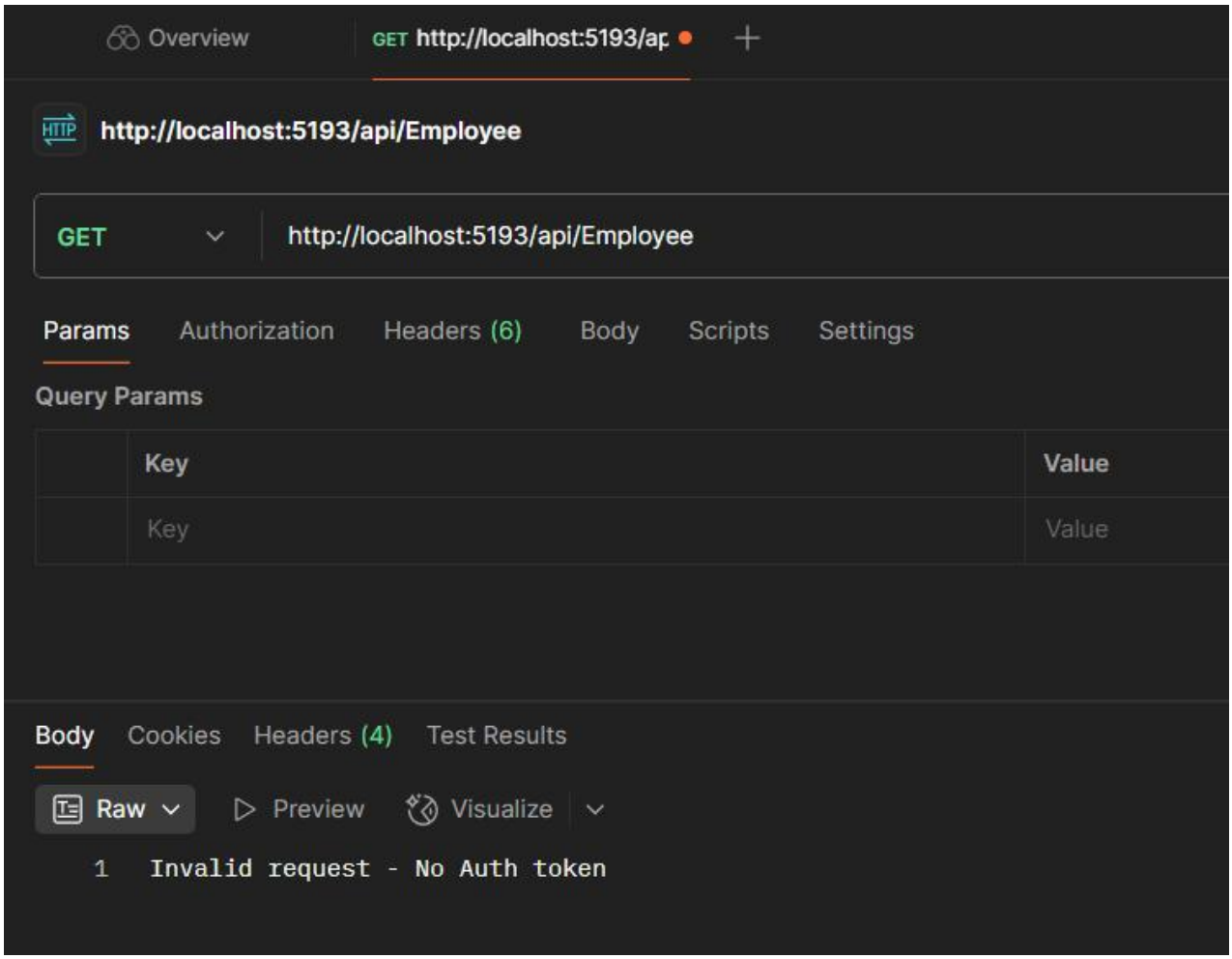
```
dotnet build
dotnet run
```

```
PS C:\Users\KIIT\OneDrive\Desktop\Web-Api\MyFirstWebAPI> dotnet build
Restore complete (0.9s)
  MyFirstWebAPI succeeded (5.6s) → bin\Debug\net9.0\MyFirstWebAPI.dll

Build succeeded in 7.6s
PS C:\Users\KIIT\OneDrive\Desktop\Web-Api\MyFirstWebAPI> dotnet run
Using launch settings from C:\Users\KIIT\OneDrive\Desktop\Web-Api\MyFirstWebAPI\Properties\launchSettings.json...
Building...
info: Microsoft.Hosting.Lifetime[14]
      Now listening on: http://localhost:5193
info: Microsoft.Hosting.Lifetime[0]
      Application started. Press Ctrl+C to shut down.
info: Microsoft.Hosting.Lifetime[0]
      Hosting environment: Development
info: Microsoft.Hosting.Lifetime[0]
      Content root path: C:\Users\KIIT\OneDrive\Desktop\Web-Api\MyFirstWebAPI
```

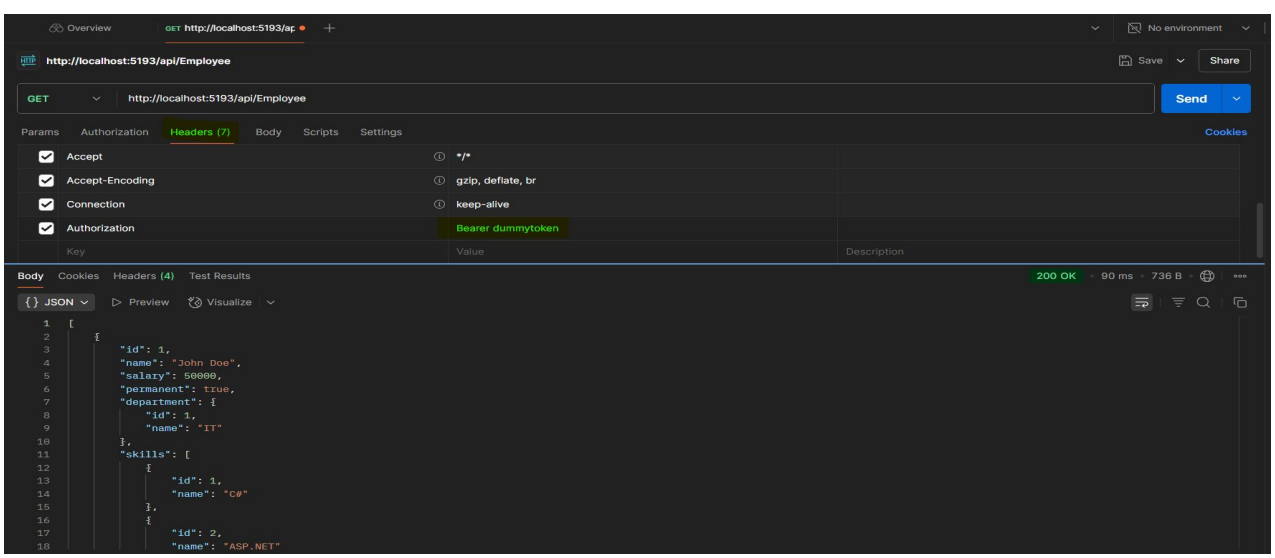
- **Without Authorization Header:**
  - GET `http://localhost:5193/api/Employee`
  - **Result:**



- **With Invalid Authorization Header in Postman:**
  - Header: `Authorization: InvalidToken`
  - **Result:**



- **With Valid Authorization Header:**
  - Header: Authorization: Bearer dummytoken
  - **Result:**



8. Creating Custom Exception Filter

8.1 Adding CustomExceptionFilter.cs

Creating `Filters/CustomExceptionFilter.cs`:

```
using Microsoft.AspNetCore.Mvc;
using Microsoft.AspNetCore.Mvc.Filters;
using System.Text.Json;

namespace MyFirstWebAPI.Filters
{
    public class CustomExceptionFilter : IExceptionFilter
    {
        public void OnException(ExceptionContext context)
        {
            var exception = context.Exception;

            var logEntry = new
            {
                TimeStamp = DateTime.Now,
                Message = exception.Message,
                StackTrace = exception.StackTrace,
                Source = exception.Source,
                InnerException = exception.InnerException?.Message
            };

            var logJson = JsonSerializer.Serialize(logEntry, new JsonSerializerOptions { WriteIndented = true });
            try
            {
                var logPath = Path.Combine(Directory.GetCurrentDirectory(), "exceptions.log");
                File.AppendAllText(logPath, logJson + Environment.NewLine + "---" + Environment.NewLine);
            }
            catch
            {
                // Ignore logging errors
            }

            context.Result = new ObjectResult(new
            {
                error = "An internal server error occurred",
                message = exception.Message,
                timestamp = DateTime.Now
            })
            {
```

```
            StatusCode = 500
        };

        context.ExceptionHandled = true;
    }
  }
}
```

9. Registering Exception Filter

9.1 Updating Program.cs

- Adding at the top:

```
using MyFirstWebAPI.Filters;
```

- Replacing controller registration:

```
builder.Services.AddControllers(options =>
{
   options.Filters.Add<CustomExceptionFilter>();
});
```

Final Code of Program.cs :

```
using Microsoft.OpenApi.Models;

using MyFirstWebAPI.Filters;


var builder = WebApplication.CreateBuilder(args);


// Add services to the container.

builder.Services.AddControllers(options =>

{

   options.Filters.Add<CustomExceptionFilter>();

});

builder.Services.AddEndpointsApiExplorer();


// Add Swagger services with custom configuration
```

```
builder.Services.AddSwaggerGen(c =>
{
    c.SwaggerDoc("v1", new OpenApiInfo
    {
        Title = "Swagger Demo",
        Version = "v1",
        Description = "Complete Web API Tutorial with .NET 9",
        TermsOfService = new Uri("https://example.com/terms"),
        Contact = new OpenApiContact
        {
            Name = "John Doe",
            Email = "john@xyzmail.com",
            Url = new Uri("https://www.example.com")
        },
        License = new OpenApiLicense
        {
            Name = "License Terms",
            Url = new Uri("https://www.example.com")
        }
    });
});

var app = builder.Build();

// Configure the HTTP request pipeline.
if (app.Environment.IsDevelopment())
{
    app.UseSwagger();
    app.UseSwaggerUI(c =>
    {
        c.SwaggerEndpoint("/swagger/v1/swagger.json", "Swagger Demo");
        c.RoutePrefix = "swagger"; // Access swagger at /swagger
```

```
    });
}

app.UseHttpsRedirection();
app.UseAuthorization();
app.MapControllers();

app.Run();
```

10. Testing Exception Filter

10.1 Adding Test Exception Endpoint

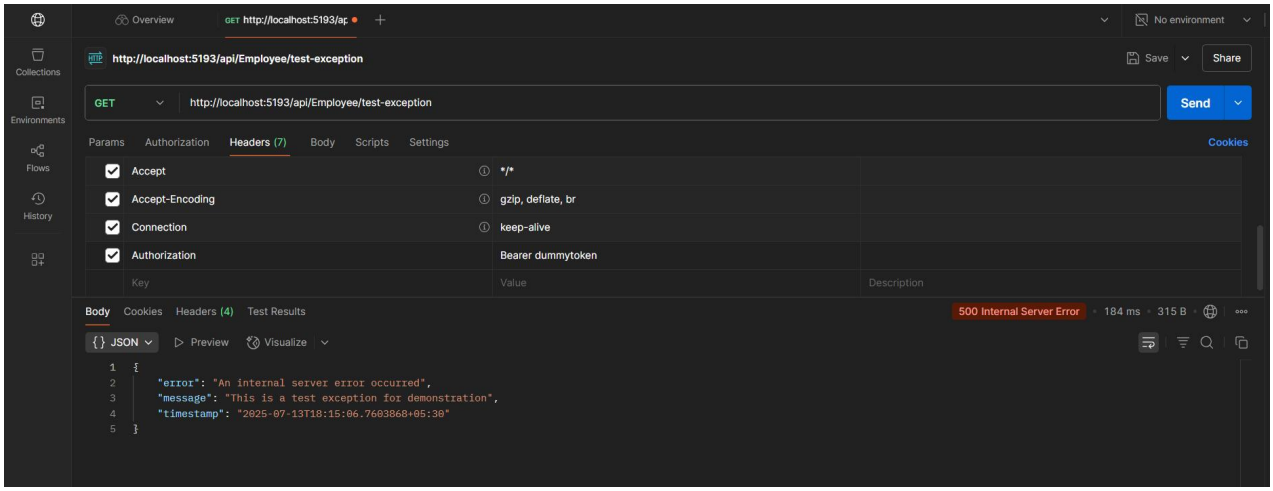
Add to `EmployeeController.cs`:

```
[HttpGet("test-exception")]
[ProducesResponseType(500)]
public ActionResult TestException()
{
    throw new Exception("This is a test exception for demonstration");
}
```

10.2 Testing in Postman

1. GET http://localhost:5193/api/Employee/test-exception
2. Header: `Authorization: Bearer dummytoken`

3. **Result:**



Exercise 4: CRUD Operations

1. Implementing the PUT (Update) Method

1.1 Adding PUT Method to EmployeeController

Insert the following method after your POST method in `EmployeeController.cs`:

```
[HttpPut("{id}")]
[ProducesResponseType(typeof(Employee), 200)]
[ProducesResponseType(400)]
[ProducesResponseType(404)]
public ActionResult<Employee> Put(int id, [FromBody] Employee employee)
{
    // Check if id is valid
    if (id <= 0)
        return BadRequest("Invalid employee id");

    // Check if employee data is provided
    if (employee == null)
        return BadRequest("Employee data is required");

    // Validate required fields
    if (string.IsNullOrWhiteSpace(employee.Name))
        return BadRequest("Employee name is required");

    if (employee.Salary <= 0)
        return BadRequest("Employee salary must be greater than 0");
```

```
    if (employee.Department == null || string.IsNullOrWhiteSpace(employee.Department.Name))
        return BadRequest("Employee department is required");

    // Find existing employee
    var existingEmployee = _employees.FirstOrDefault(e => e.Id == id);
    if (existingEmployee == null)
        return BadRequest("Invalid employee id");

    // Update employee data
    existingEmployee.Name = employee.Name;
    existingEmployee.Salary = employee.Salary;
    existingEmployee.Permanent = employee.Permanent;
    existingEmployee.Department = employee.Department;
    existingEmployee.Skills = employee.Skills;
    existingEmployee.DateOfBirth = employee.DateOfBirth;

    return Ok(existingEmployee);
}
```

1.2 Testing the PUT Method

- Build and run your project:

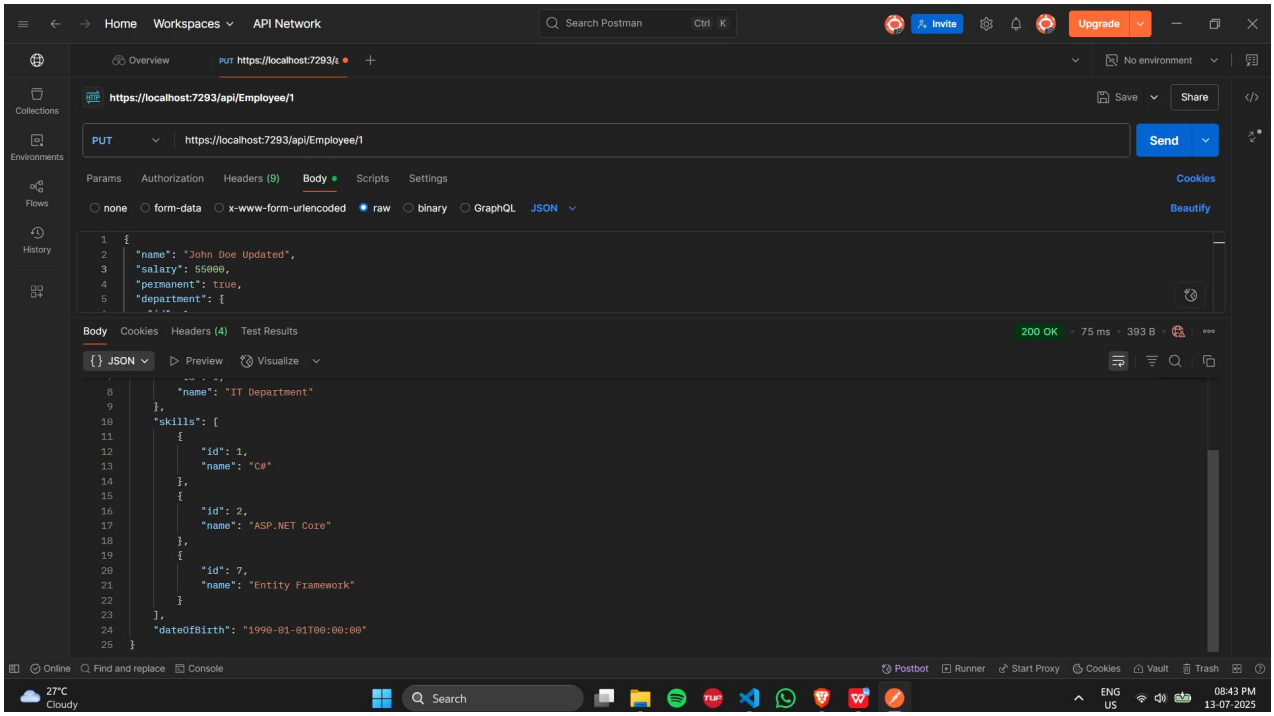
  ```
  dotnet build
  dotnet run
  ```

- Test with Postman:
  - Method: PUT
  - URL: https://localhost:7293/api/Employee/1
  - Headers: `Authorization: Bearer dummytoken`
  - Body (JSON):

    ```
    {
     "name": "John Doe Updated",
     "salary": 55000,
     "permanent": true,
     "department": { "id": 1, "name": "IT Department" },
     "skills": [
       { "id": 1, "name": "C#" },
       { "id": 2, "name": "ASP.NET Core" },
       { "id": 7, "name": "Entity Framework" }
     ],
    ```

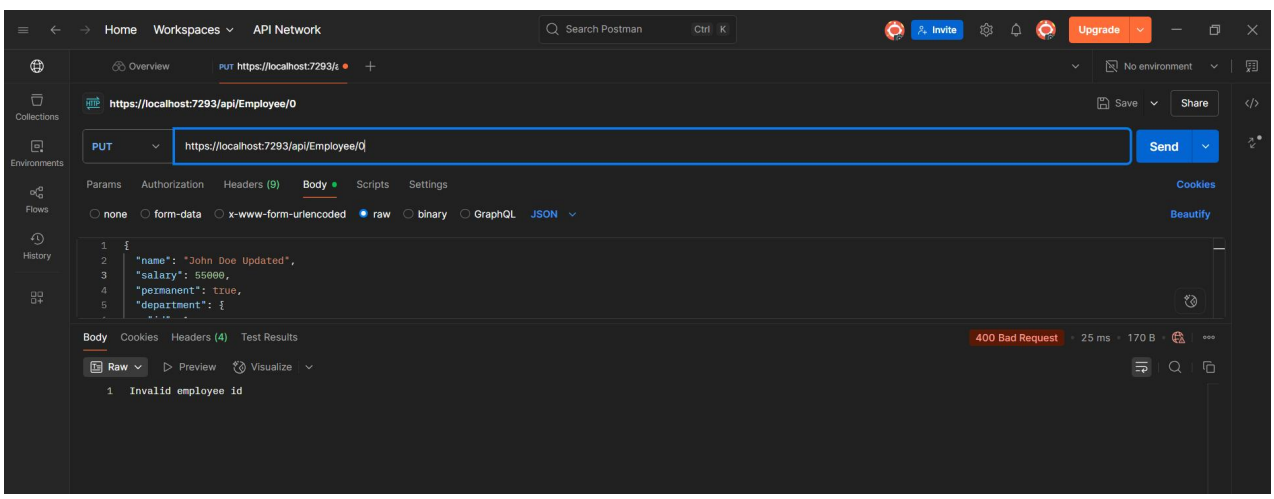
```
"dateOfBirth": "1990-01-01T00:00:00"
}
```

- Response:

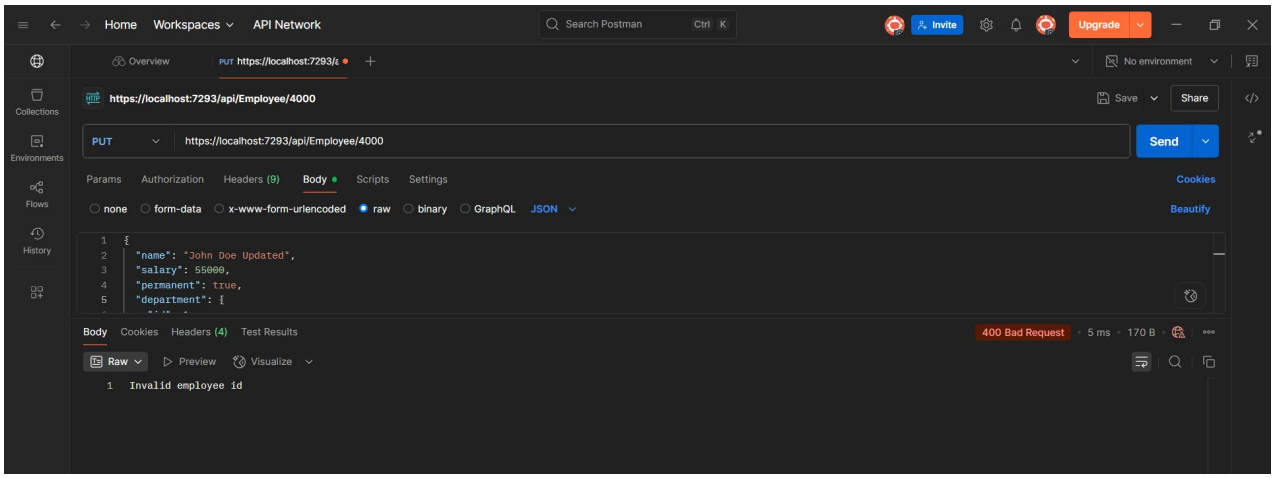


Error Cases Tested:

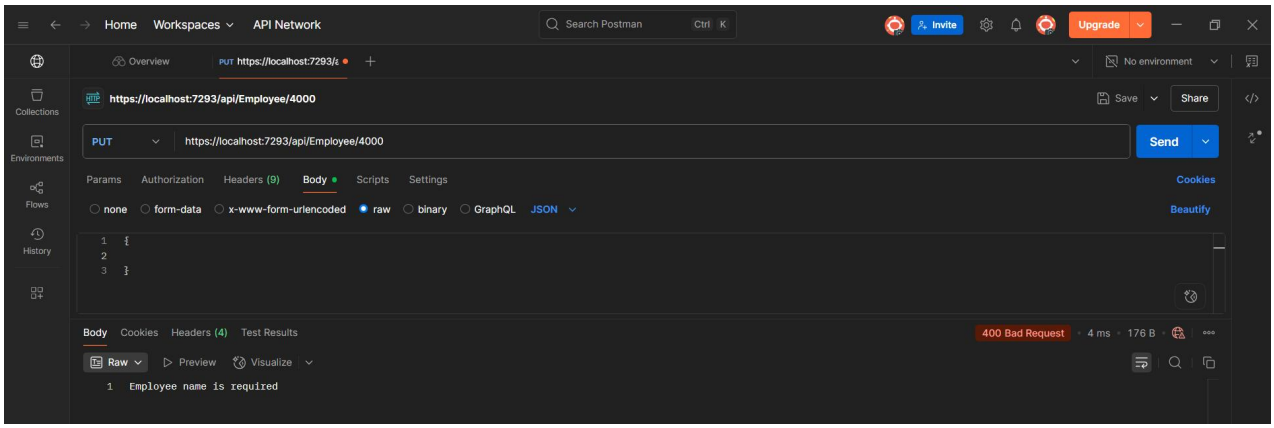
- Invalid ID (0 or negative):



- Non-existent ID:



- No body data:



2. Implementing the DELETE Method

2.1 Adding DELETE Method to EmployeeController

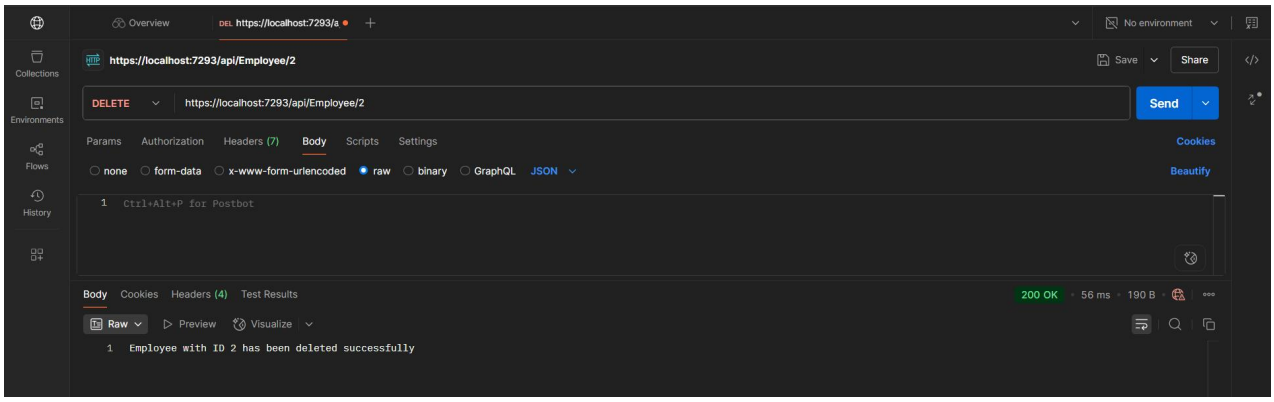
Adding this method after the PUT method:

```
[HttpDelete("{id}")]
[ProducesResponseType(200)]
[ProducesResponseType(400)]
[ProducesResponseType(404)]
public ActionResult Delete(int id)
{
    // Check if id is valid
    if (id <= 0)
        return BadRequest("Invalid employee id");

    // Find existing employee
    var existingEmployee = _employees.FirstOrDefault(e => e.Id == id);
```

```
    if (existingEmployee == null)
        return BadRequest("Invalid employee id");

    // Remove employee
    _employees.Remove(existingEmployee);

    return Ok($"Employee with ID {id} has been deleted successfully");
}
```

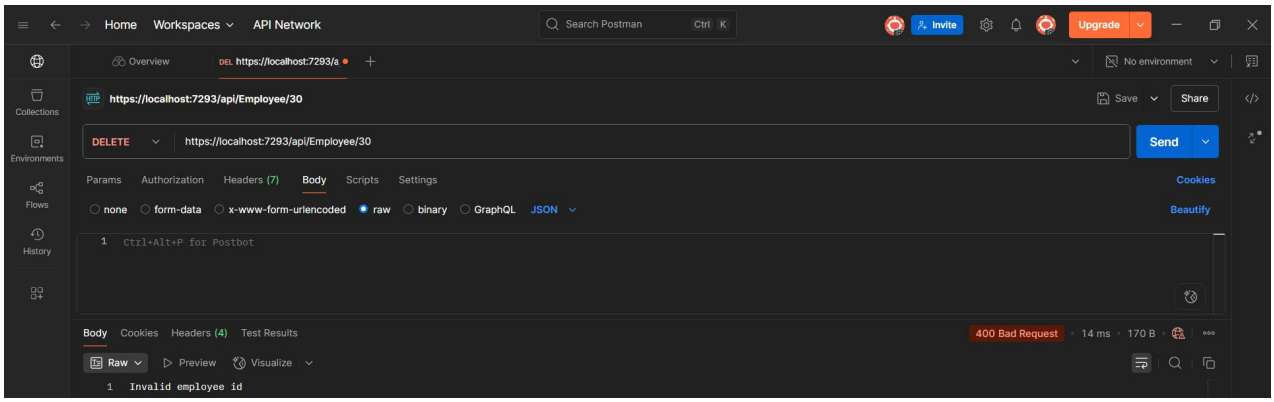
2.2 Testing the DELETE Method

- Method: DELETE
- URL: https://localhost:7293/api/Employee/2
- Headers: `Authorization: Bearer dummytoken`
- Response:

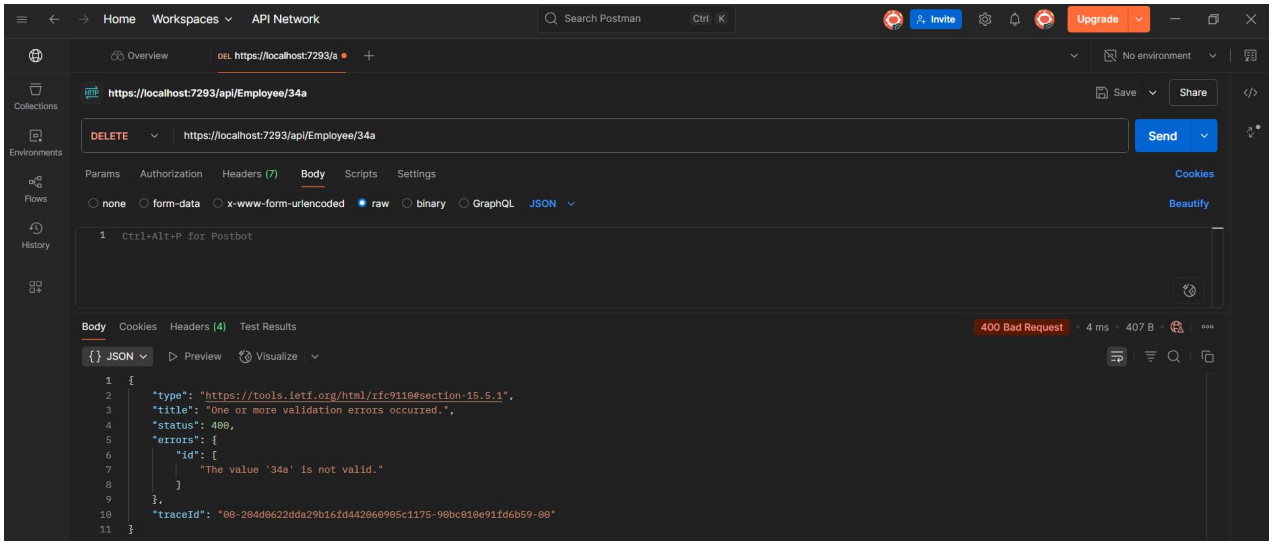


Error Cases Tested:

- Invalid ID:



- Non-existent ID:



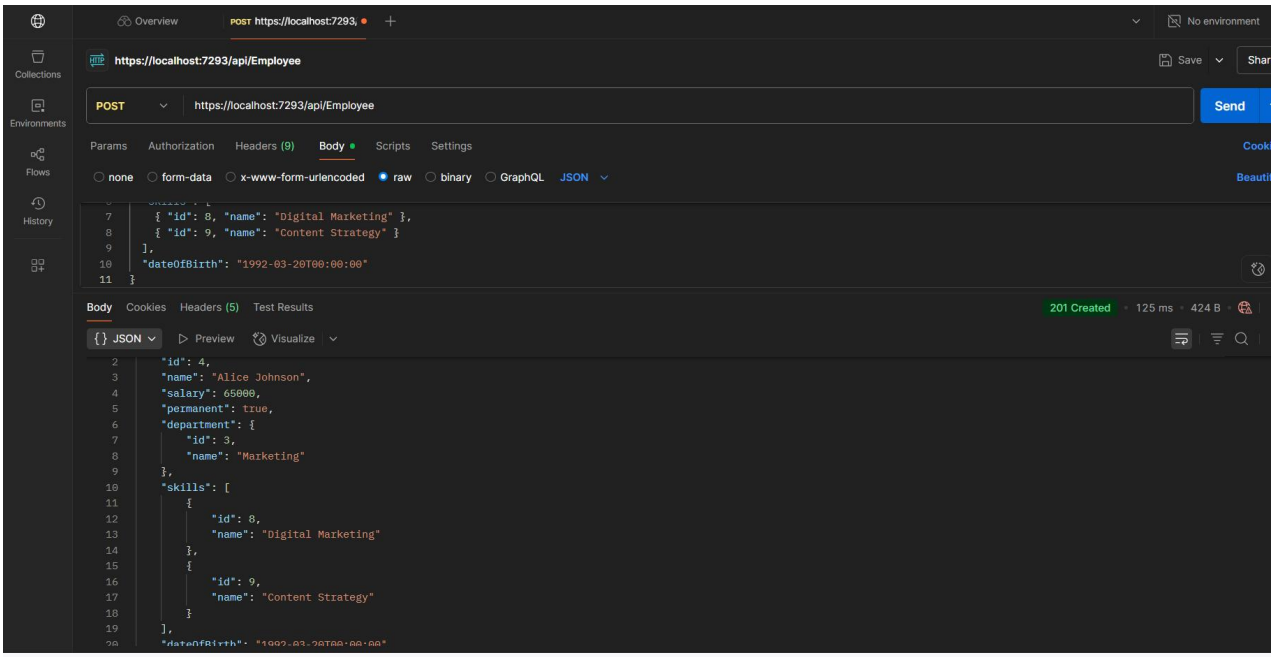
3. Complete CRUD Testing

3.1 Test Full CRUD Flow

1. **CREATE (POST)**
   - URL: https://localhost:7293/api/Employee
   - Body:

```
{
 "name": "Alice Johnson",
 "salary": 65000,
 "permanent": true,
 "department": { "id": 3, "name": "Marketing" },
 "skills": [
   { "id": 8, "name": "Digital Marketing" },
   { "id": 9, "name": "Content Strategy" }
 ],
 "dateOfBirth": "1992-03-20T00:00:00"
}
```

RESULT:



2. **READ (GET) – All employees**

   - URL: https://localhost:7293/api/Employee

     RESULT:


```
[
    {
        "id": 1,
        "name": "John Doe",
        "salary": 50000,
        "permanent": true,
        "department": {
            "id": 1,
            "name": "IT"
        },
        "skills": [
            {
                "id": 1,
                "name": "C#"
            },
            {
                "id": 2,
                "name": "ASP.NET"
            }
```

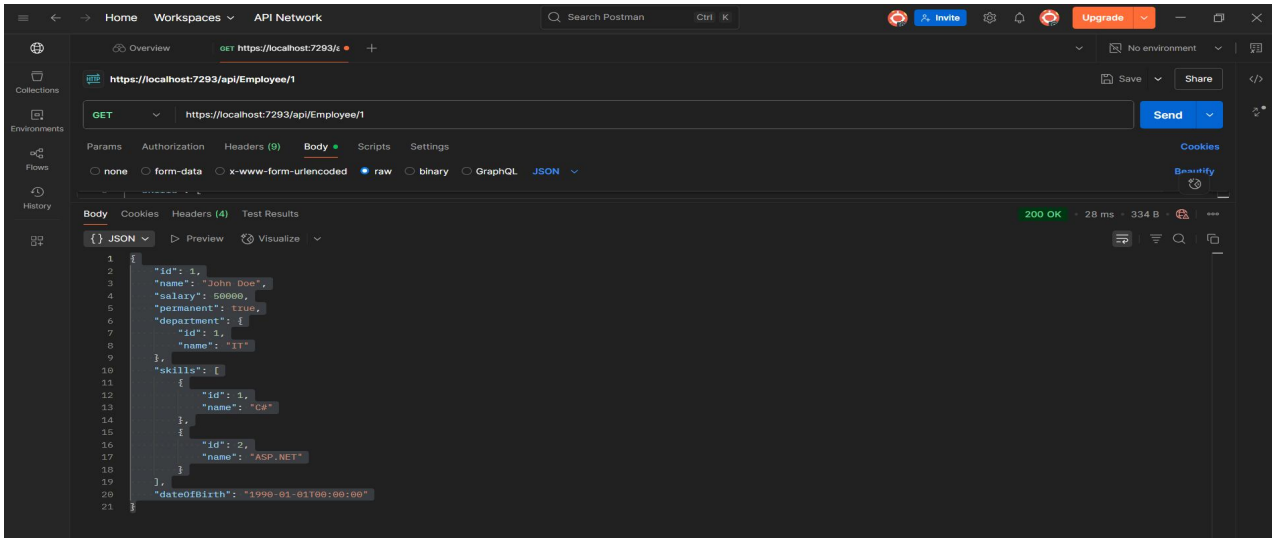
```
        ],
        "dateOfBirth": "1990-01-01T00:00:00"
    },
    {
        "id": 3,
        "name": "Bob Johnson",
        "salary": 55000,
        "permanent": true,
        "department": {
            "id": 1,
            "name": "IT"
        },
        "skills": [
            {
                "id": 5,
                "name": "JavaScript"
            },
            {
                "id": 6,
                "name": "React"
            }
        ],
        "dateOfBirth": "1988-12-10T00:00:00"
    },
    {
        "id": 4,
        "name": "Alice Johnson",
        "salary": 65000,
        "permanent": true,
        "department": {
            "id": 3,
            "name": "Marketing"
        },
        "skills": [
            {
                "id": 8,
                "name": "Digital Marketing"
            },
            {
```

```
                "id": 9,
                "name": "Content Strategy"
            }
        ],
        "dateOfBirth": "1992-03-20T00:00:00"
    }
]
```


3. **READ (GET) – Single employee**

   URL:

   https://localhost:7293/api/Employee/1

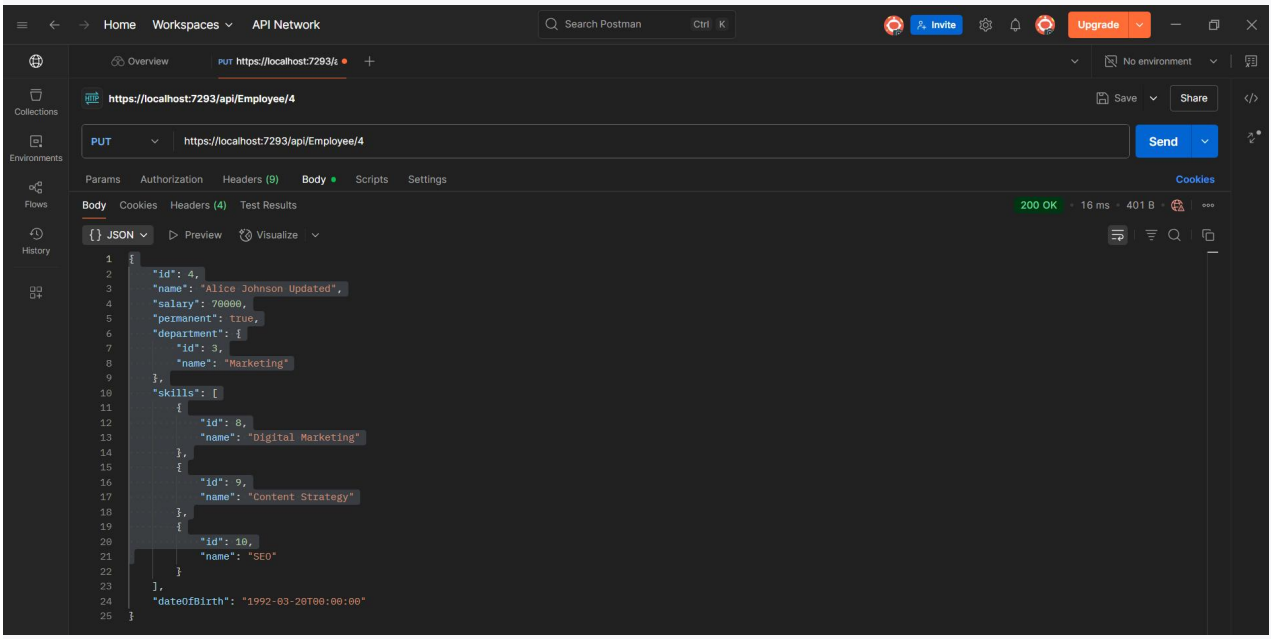


4. **UPDATE (PUT)**

   - URL: https://localhost:7293/api/Employee/4
   - Body:

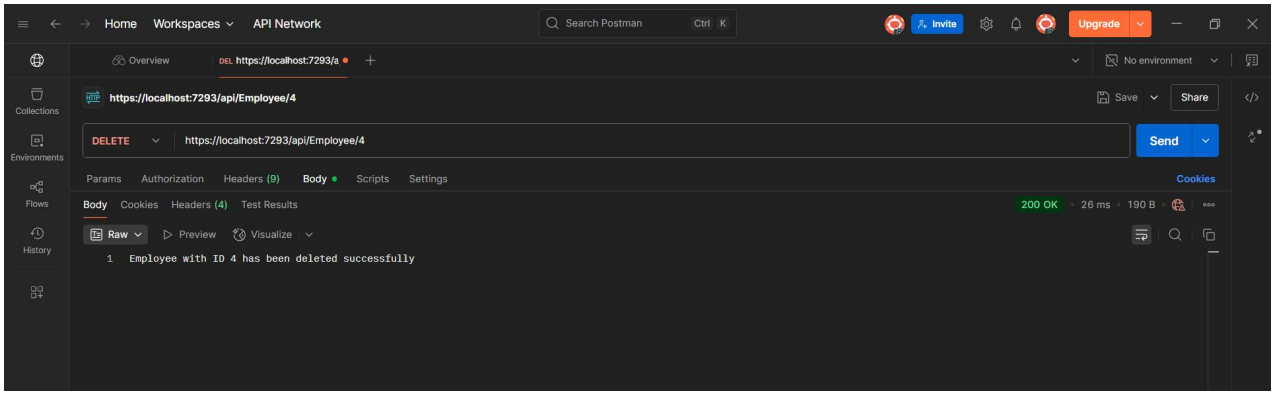

```
{
 "name": "Alice Johnson Updated",
 "salary": 70000,
 "permanent": true,
 "department": { "id": 3, "name": "Marketing" },
 "skills": [
   { "id": 8, "name": "Digital Marketing" },
   { "id": 9, "name": "Content Strategy" },
   { "id": 10, "name": "SEO" }
 ],
 "dateOfBirth": "1992-03-20T00:00:00"
}
```

RESULT:



5. **DELETE**

URL: https://localhost:7293/api/Employee/4



Exercise 5: JWT Authentication

1. Installing Required Packages

Running the following commands in the project root to add JWT support:

```
dotnet add package Microsoft.AspNetCore.Authentication.JwtBearer
dotnet add package System.IdentityModel.Tokens.Jwt
```

```
PROBLEMS   OUTPUT   DEBUG CONSOLE   TERMINAL   PORTS                                   powershell - MyFirstWebAPI

info :   OK https://api.nuget.org/v3/vulnerabilities/index.json 286ms
info :   GET https://api.nuget.org/v3-vulnerabilities/2025.07.10.23.23.28/vulnerability.base.json
info :   GET https://api.nuget.org/v3-vulnerabilities/2025.07.10.23.23.28/2025.07.13.11.23.36/vulnerability.update.json
info :   OK https://api.nuget.org/v3-vulnerabilities/2025.07.10.23.23.28/2025.07.13.11.23.36/vulnerability.update.json 288ms
info :   OK https://api.nuget.org/v3-vulnerabilities/2025.07.10.23.23.28/vulnerability.base.json 290ms
info : Package 'Microsoft.AspNetCore.Authentication.JwtBearer' is compatible with all the specified frameworks in project 'C:\Users\KIIT\OneDrive\Desktop\Web-Api\MyFirstW
ebAPI\MyFirstWebAPI.csproj'.
info : PackageReference for package 'Microsoft.AspNetCore.Authentication.JwtBearer' version '9.0.7' added to file 'C:\Users\KIIT\OneDrive\Desktop\Web-Api\MyFirstWebAPI\My
FirstWebAPI.csproj'.
info : Writing assets file to disk. Path: C:\Users\KIIT\OneDrive\Desktop\Web-Api\MyFirstWebAPI\obj\project.assets.json
log  : Restored C:\Users\KIIT\OneDrive\Desktop\Web-Api\MyFirstWebAPI\MyFirstWebAPI.csproj (in 5.04 sec).
PS C:\Users\KIIT\OneDrive\Desktop\Web-Api\MyFirstWebAPI>
```

```
PROBLEMS   OUTPUT   DEBUG CONSOLE   TERMINAL   PORTS                                   powershell - MyFirstWebAPI

stractions\8.0.0 with content hash arDBqTgFCyS0EvRV7O3MZturChstm50OJ0y9bDJvAcmEPJm0FFpFyjU/JLYyStNGGey081DvnQYlncNX5SJJGA==.
info :   CACHE https://api.nuget.org/v3/vulnerabilities/index.json
info :   CACHE https://api.nuget.org/v3-vulnerabilities/2025.07.10.23.23.28/vulnerability.base.json
info :   CACHE https://api.nuget.org/v3-vulnerabilities/2025.07.10.23.23.28/2025.07.13.11.23.36/vulnerability.update.json
info : Package 'System.IdentityModel.Tokens.Jwt' is compatible with all the specified frameworks in project 'C:\Users\KIIT\OneDrive\Desktop\Web-Api\MyFirstWebAPI\MyFirstW
ebAPI.csproj'.
info : PackageReference for package 'System.IdentityModel.Tokens.Jwt' version '8.12.1' added to file 'C:\Users\KIIT\OneDrive\Desktop\Web-Api\MyFirstWebAPI\MyFirstWebAPI.c
sproj'.
info : Generating MSBuild file C:\Users\KIIT\OneDrive\Desktop\Web-Api\MyFirstWebAPI\obj\MyFirstWebAPI.csproj.nuget.g.targets.
info : Writing assets file to disk. Path: C:\Users\KIIT\OneDrive\Desktop\Web-Api\MyFirstWebAPI\obj\project.assets.json
log  : Restored C:\Users\KIIT\OneDrive\Desktop\Web-Api\MyFirstWebAPI\MyFirstWebAPI.csproj (in 5.1 sec).
PS C:\Users\KIIT\OneDrive\Desktop\Web-Api\MyFirstWebAPI>
```

2. Updating Program.cs for JWT Configuration

Final Program.cs:

```
using Microsoft.AspNetCore.Authentication.JwtBearer;

using Microsoft.IdentityModel.Tokens;

using Microsoft.OpenApi.Models;

using MyFirstWebAPI.Filters;

using System.Text;


var builder = WebApplication.CreateBuilder(args);


// JWT Configuration

string securityKey = "mysuperdupersecret_that_is_long_enough_for_security";

var symmetricSecurityKey = new SymmetricSecurityKey(Encoding.UTF8.GetBytes(securityKey));


// Add Authentication

builder.Services.AddAuthentication(x =>

{

    x.DefaultAuthenticateScheme = JwtBearerDefaults.AuthenticationScheme;

    x.DefaultChallengeScheme = JwtBearerDefaults.AuthenticationScheme;

})
```

```
.AddJwtBearer(x =>
{
    x.TokenValidationParameters = new TokenValidationParameters
    {
        ValidateIssuer = true,
        ValidateAudience = true,
        ValidateLifetime = true,
        ValidateIssuerSigningKey = true,
        ValidIssuer = "mySystem",
        ValidAudience = "myUsers",
        IssuerSigningKey = symmetricSecurityKey,
        ClockSkew = TimeSpan.Zero
    };
});

// Add services to the container, including your custom exception filter
builder.Services.AddControllers(options =>
{
    options.Filters.Add<CustomExceptionFilter>();
});

builder.Services.AddEndpointsApiExplorer();

// Add Swagger services with custom configuration and JWT support
builder.Services.AddSwaggerGen(c =>
{
    c.SwaggerDoc("v1", new OpenApiInfo
    {
        Title = "Swagger Demo with JWT",
        Version = "v1",
        Description = "Complete Web API Tutorial with .NET 9 and JWT Authentication",
        TermsOfService = new Uri("https://example.com/terms"),
```

```
    Contact = new OpenApiContact
    {
        Name = "Sachin Ray",
        Email = "sachin@xyzmail.com",
        Url = new Uri("https://www.example.com")
    },
    License = new OpenApiLicense
    {
        Name = "License Terms",
        Url = new Uri("https://www.example.com")
    }
});

// Add JWT Authentication to Swagger
c.AddSecurityDefinition("Bearer", new OpenApiSecurityScheme
{
    Description = "JWT Authorization header using the Bearer scheme. Example: \"Authorization: Bearer {token}\"",
    Name = "Authorization",
    In = ParameterLocation.Header,
    Type = SecuritySchemeType.ApiKey,
    Scheme = "Bearer"
});

c.AddSecurityRequirement(new OpenApiSecurityRequirement
{
    {
        new OpenApiSecurityScheme
        {
            Reference = new OpenApiReference
            {
                Type = ReferenceType.SecurityScheme,
                Id = "Bearer"
```

```
            }
        },
        new string[] {}
    }
  });
});

var app = builder.Build();

// Configure the HTTP request pipeline.
if (app.Environment.IsDevelopment())
{
  app.UseSwagger();
  app.UseSwaggerUI(c =>
  {
    c.SwaggerEndpoint("/swagger/v1/swagger.json", "Swagger Demo with JWT");
    c.RoutePrefix = "swagger"; // Access swagger at /swagger
  });
}

app.UseHttpsRedirection();

// Add Authentication and Authorization middleware (ORDER MATTERS!)
app.UseAuthentication();
app.UseAuthorization();

app.MapControllers();

app.Run();
```

3. Adding JWT Models

Appending these classes to `Models/Employee.cs`:

```
public class LoginRequest
{
    public string Username { get; set; } = string.Empty;
    public string Password { get; set; } = string.Empty;
}

public class LoginResponse
{
    public string Token { get; set; } = string.Empty;
    public string Username { get; set; } = string.Empty;
    public string Role { get; set; } = string.Empty;
    public DateTime ExpiresAt { get; set; }
}
```

4. Creating `AuthController`

Creating `Controllers/AuthController.cs`:

```
using Microsoft.AspNetCore.Authorization;
using Microsoft.AspNetCore.Mvc;
using Microsoft.IdentityModel.Tokens;
using MyFirstWebAPI.Models;
using System.IdentityModel.Tokens.Jwt;
using System.Security.Claims;
using System.Text;

namespace MyFirstWebAPI.Controllers
{
    [AllowAnonymous]
    [ApiController]
    [Route("api/[controller]")]
    public class AuthController : ControllerBase
    {
        [HttpGet("generate-token")]
        public ActionResult<LoginResponse> GenerateToken()
        {
            var token = GenerateJSONWebToken(1, "Admin");
            return Ok(new LoginResponse
            {
                Token = token,
                Username = "admin",
                Role = "Admin",
```

```
        ExpiresAt = DateTime.Now.AddMinutes(10)
    });
}

[HttpGet("generate-token-short")]
public ActionResult<LoginResponse> GenerateTokenShort()
{
    var token = GenerateJSONWebToken(1, "Admin", 2);
    return Ok(new LoginResponse
    {
        Token = token,
        Username = "admin",
        Role = "Admin",
        ExpiresAt = DateTime.Now.AddMinutes(2)
    });
}

[HttpPost("login")]
public ActionResult<LoginResponse> Login([FromBody] LoginRequest request)
{
    if (request.Username == "admin" && request.Password == "admin123")
    {
        var token = GenerateJSONWebToken(1, "Admin");
        return Ok(new LoginResponse
        {
            Token = token,
            Username = "admin",
            Role = "Admin",
            ExpiresAt = DateTime.Now.AddMinutes(10)
        });
    }
    return Unauthorized("Invalid username or password");
}

[HttpGet("generate-token-poc")]
public ActionResult<LoginResponse> GenerateTokenPOC()
{
    var token = GenerateJSONWebToken(2, "POC");
    return Ok(new LoginResponse
    {
        Token = token,
        Username = "poc_user",
        Role = "POC",
        ExpiresAt = DateTime.Now.AddMinutes(10)
    });
```

```
    }

    private string GenerateJSONWebToken(int userId, string userRole, int expirationMinutes = 10)
    {
        var securityKey = new
SymmetricSecurityKey(Encoding.UTF8.GetBytes("mysuperdupersecret_that_is_long_enough_for_security"));
        var credentials = new SigningCredentials(securityKey, SecurityAlgorithms.HmacSha256);

        var claims = new List<Claim>
        {
            new Claim(ClaimTypes.Role, userRole),
            new Claim("UserId", userId.ToString())
        };

        var token = new JwtSecurityToken(
            issuer: "mySystem",
            audience: "myUsers",
            claims: claims,
            expires: DateTime.Now.AddMinutes(expirationMinutes),
            signingCredentials: credentials
        );

        return new JwtSecurityTokenHandler().WriteToken(token);
    }
  }
}
```

5. Update EmployeeController for Authorization

Replace `[CustomAuthFilter]` with `[Authorize]`:

```
using Microsoft.AspNetCore.Authorization;
using Microsoft.AspNetCore.Mvc;
using MyFirstWebAPI.Models;

namespace MyFirstWebAPI.Controllers
{
  [Authorize]
  [ApiController]
  [Route("api/[controller]")]
  public class EmployeeController : ControllerBase
  {
    // ... existing methods
  }
```

```
}
```

For role-based access, use:

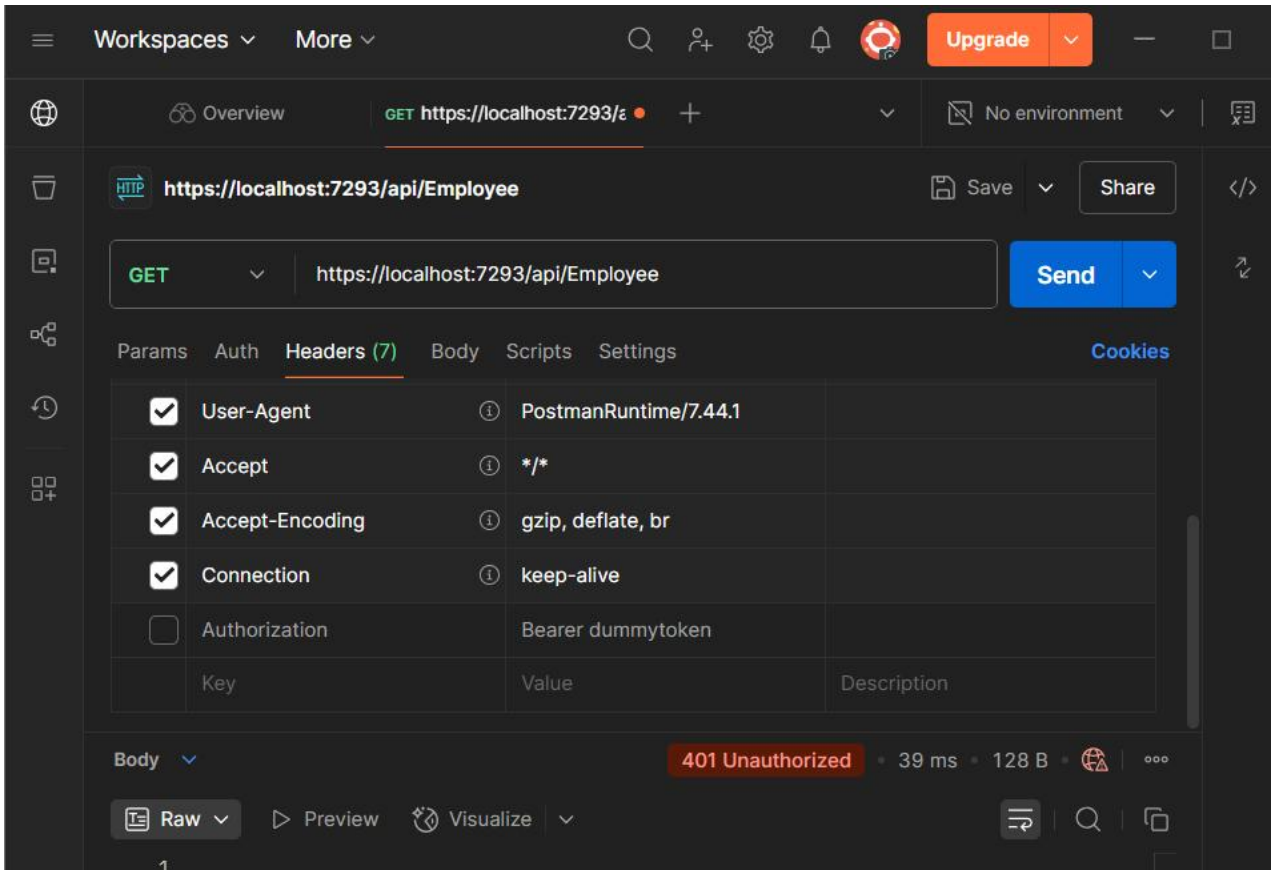
```
[Authorize(Roles = "POC")] // Only POC role
// or
[Authorize(Roles = "Admin,POC")] // Both Admin and POC
```

6. Testings Done:

- **Without Token:**

  `GET /api/Employee`

Result:

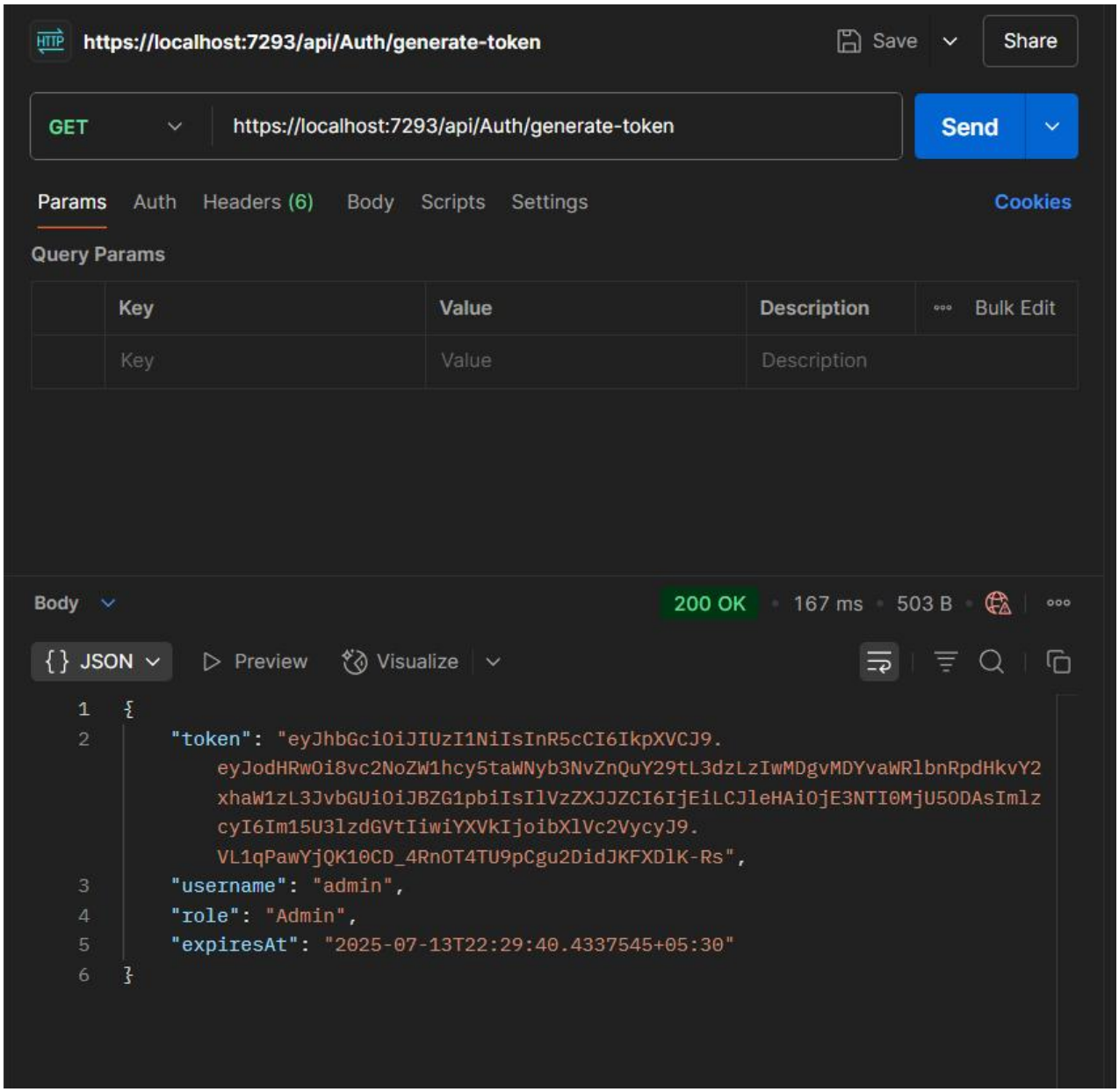


- **Get Token:**

  `GET /api/Auth/generate-token`

  Using the received token for subsequent requests.

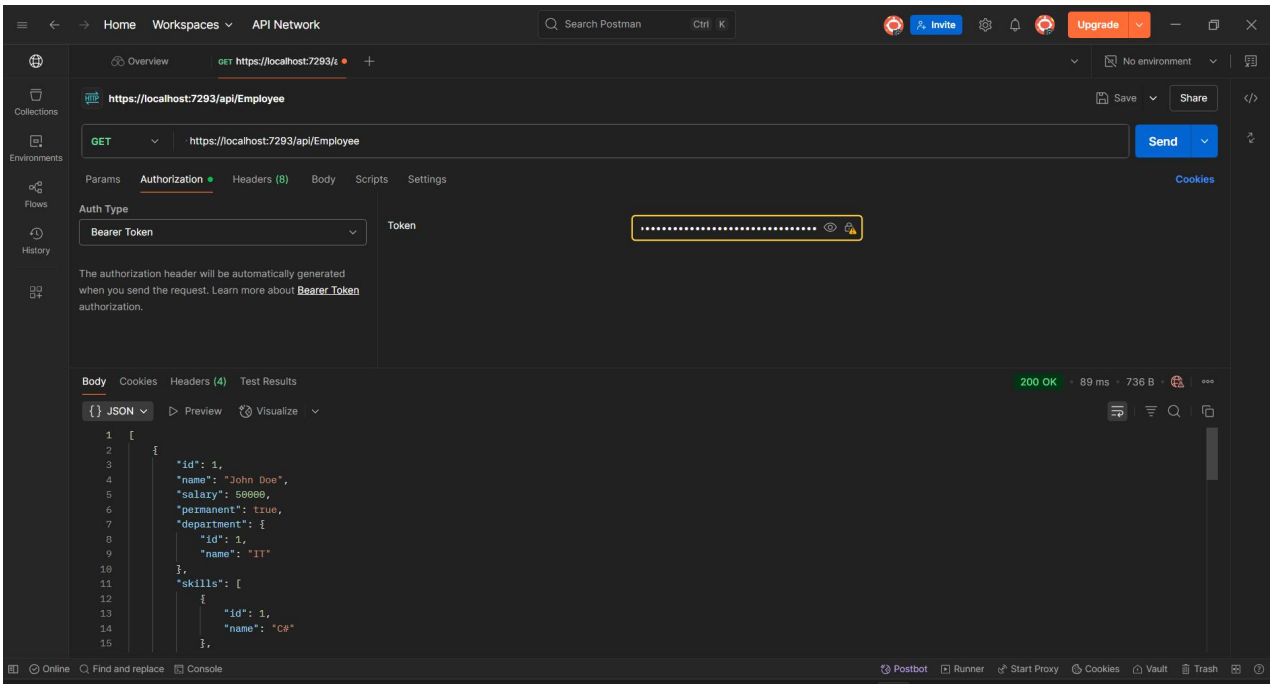
Result:



- **With Token:**

  GET /api/Employee

RESULT:

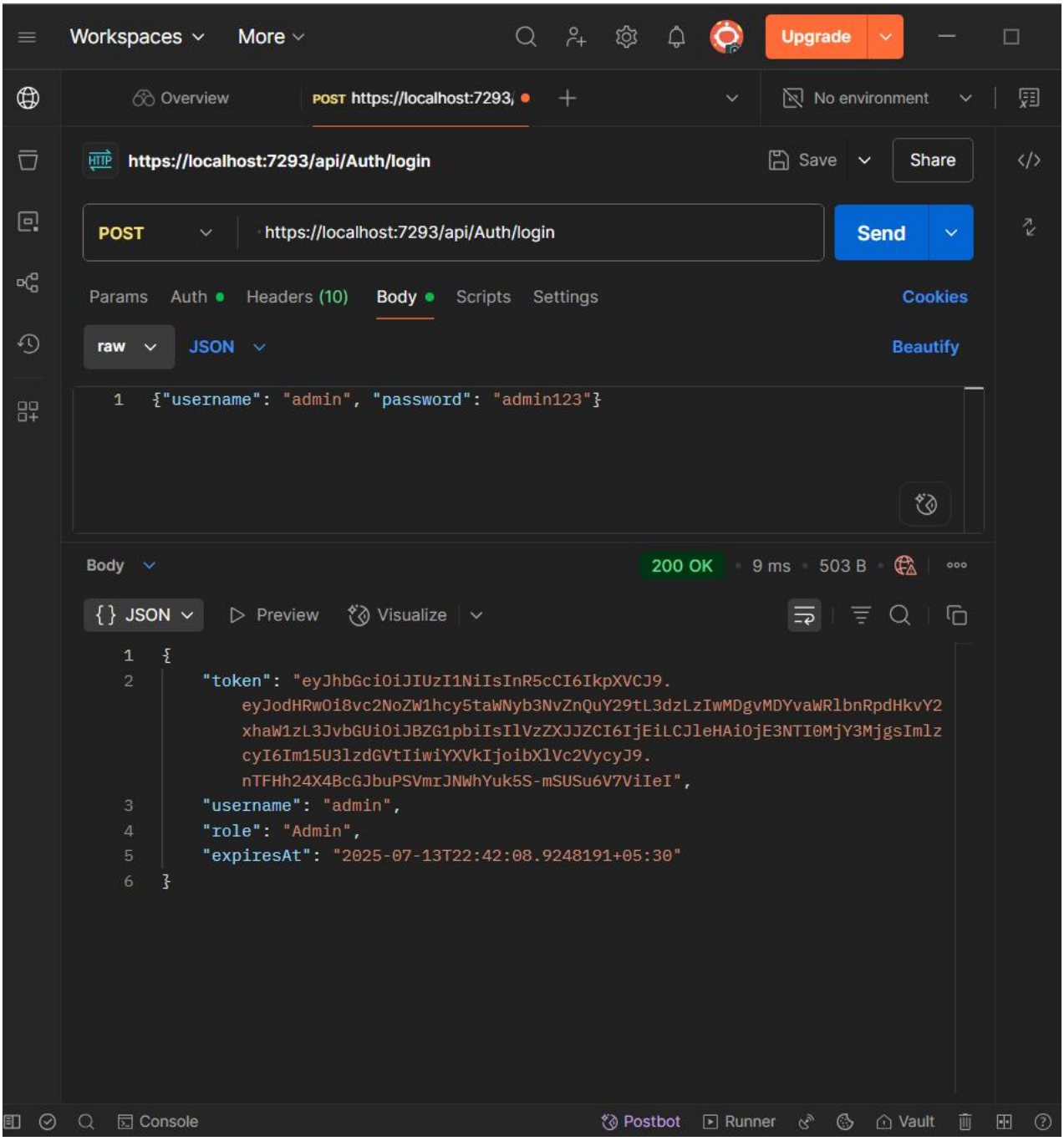


- **Login:**

  POST /api/Auth/login

  Body: {"username": "admin", "password": "admin123"}

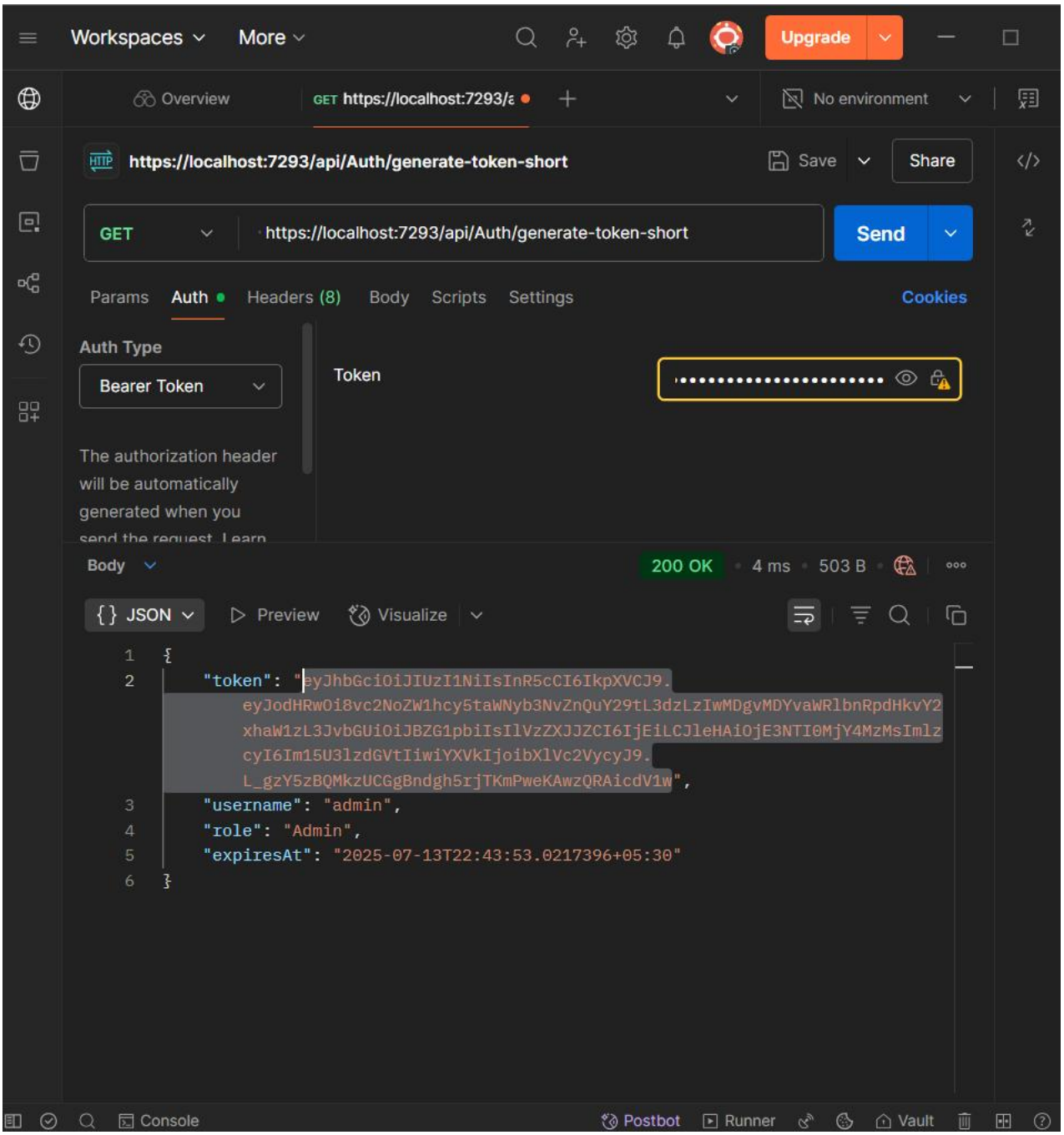
RESULT:



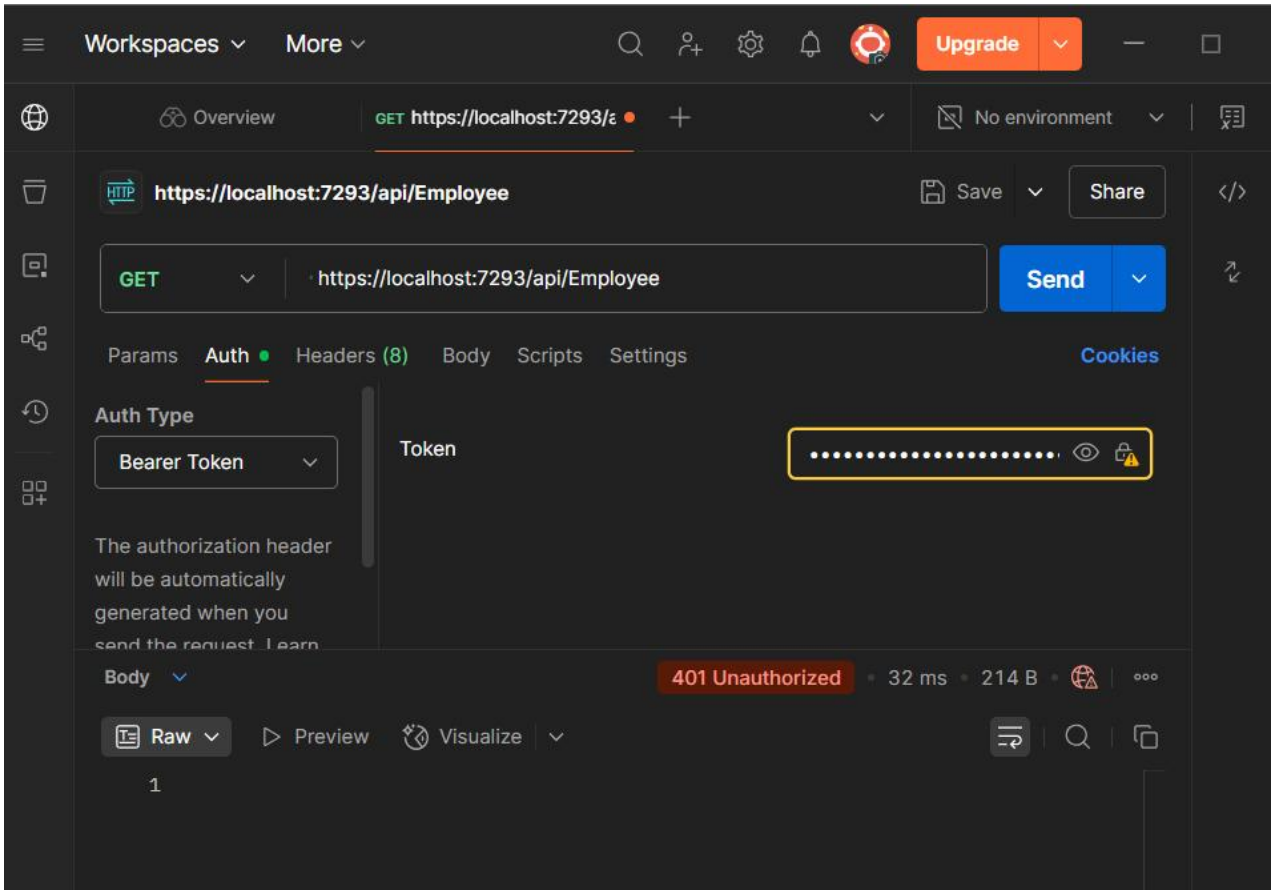
- **Token Expiration:**

  GET /api/Auth/generate-token-short

RESULT: Waited 2+ minutes, then tried /api/Employee with expired token. The result is here



After 2 minutes:



- **Role-Based Authorization:**

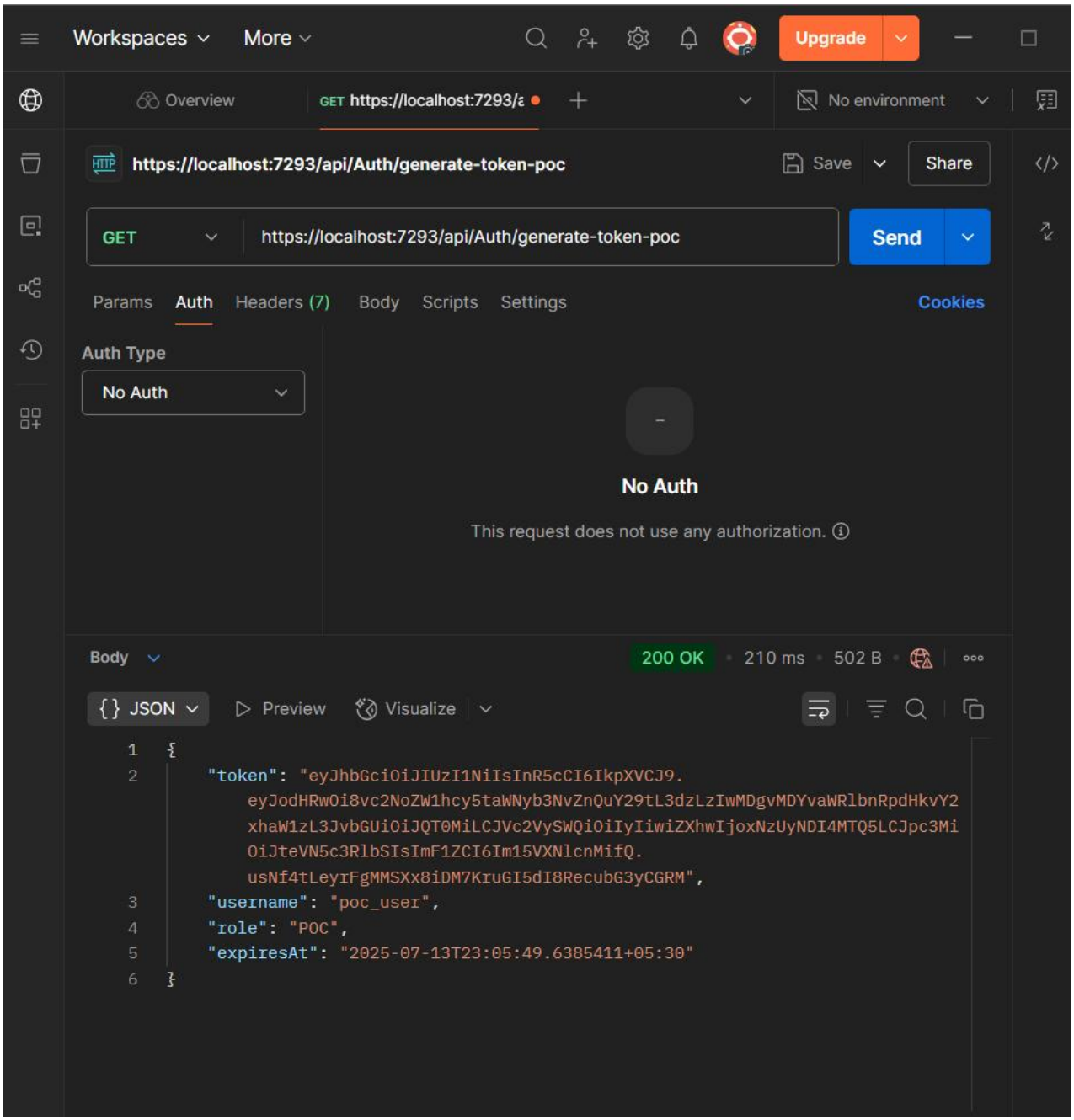
- Changed [Authorize(Roles = "POC")] in EmployeeController

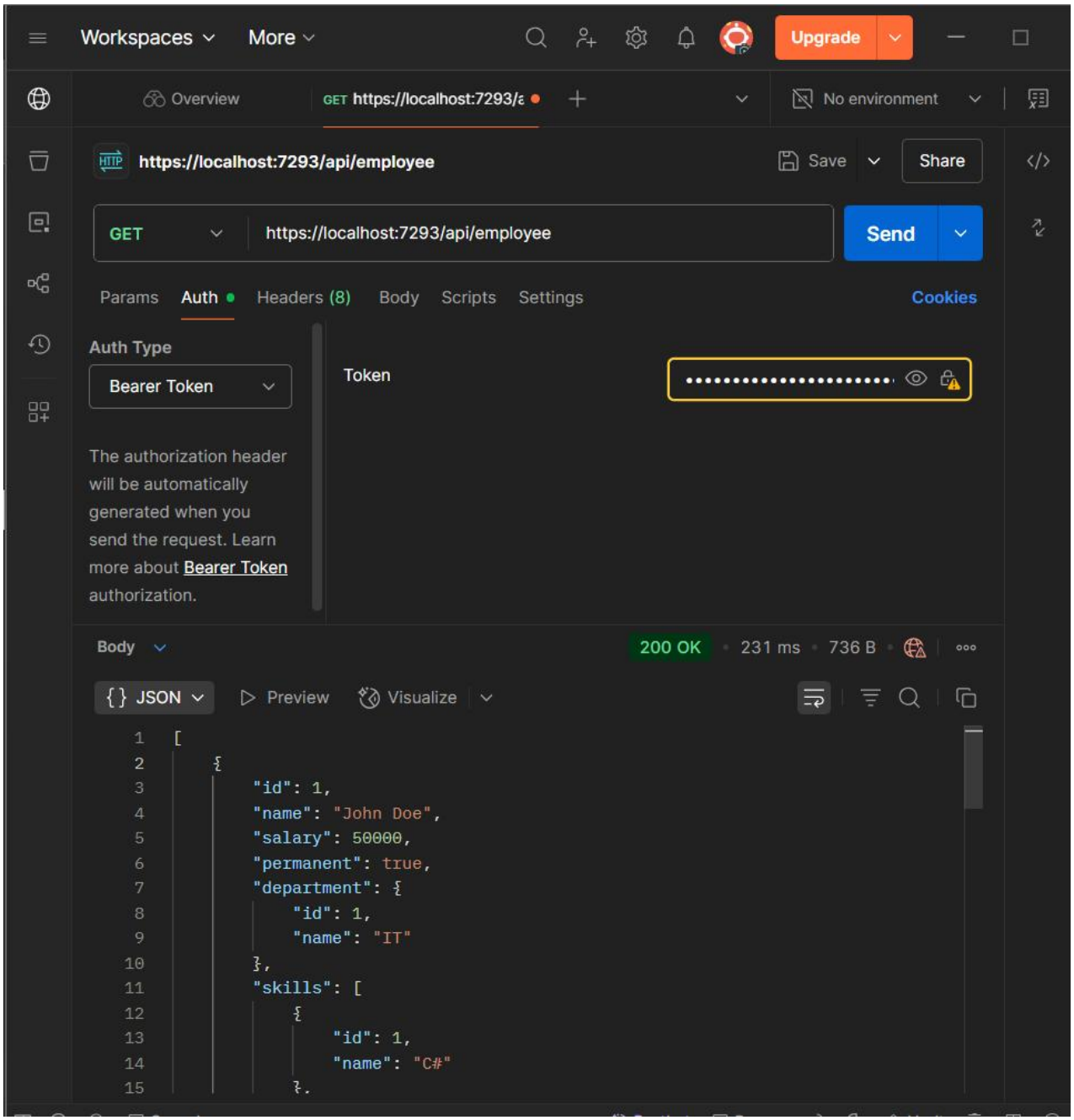
```
// }

//Exercise-5

using Microsoft.AspNetCore.Authorization;
using Microsoft.AspNetCore.Mvc;
using MyFirstWebAPI.Models;
// using MyFirstWebAPI.Filters; // No longer needed for JWT

namespace MyFirstWebAPI.Controllers
{

    // [Authorize] // Any authenticated user

    [Authorize(Roles = "POC")] // Only users with "POC" role

    // [Authorize(Roles = "Admin,POC")] // Users with "Admin" OR "POC" roles


    [ApiController]
    [Route("api/[controller]")]
    1 reference
    public class EmployeeController : ControllerBase
```

- Use /api/Auth/generate-token-poc for a POC token

  Result:

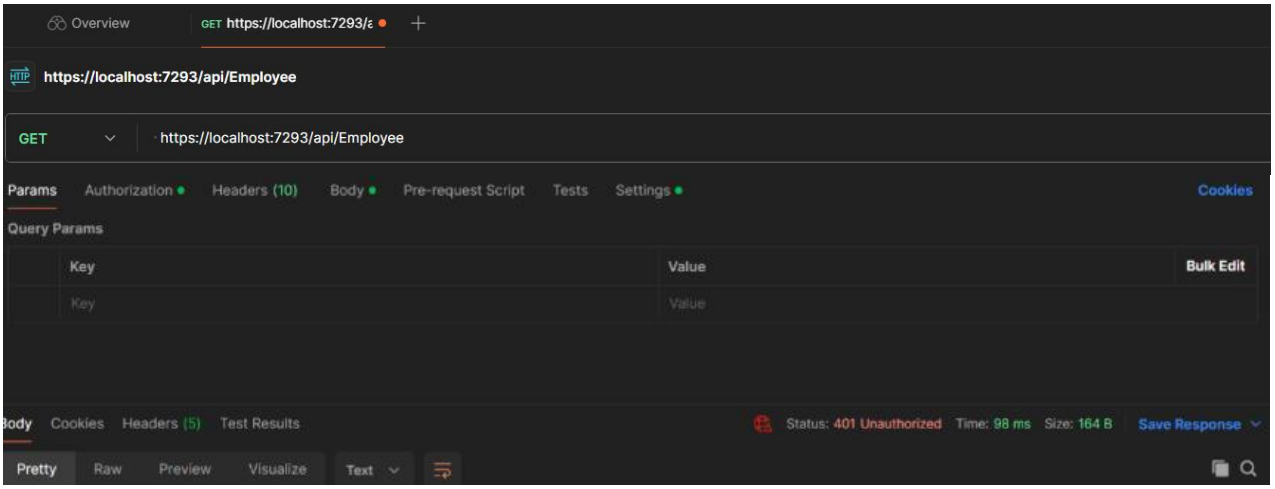
- **POC-Token:**


Workspaces
More
Upgrade
Overview
GET https://localhost:7293/a
No environment
https://localhost:7293/api/Auth/generate-token-poc
Save
Share
GET
https://localhost:7293/api/Auth/generate-token-poc
Send
Params
Auth
Headers (7)
Body
Scripts
Settings
Cookies
Auth Type
No Auth
No Auth
This request does not use any authorization.
Body
200 OK
210 ms
502 B
JSON
Preview
Visualize
{
"token": "eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.
eyJodHRwOi8vc2NoZW1hcy5taWNyb3NvZnQuY29tL3dzLzIwMDgvMDYvaWRlbnRpdHkvY2
xhaW1zL3JvbGUiOiJQT0MiLCJVc2VySWQiOiIyIiwiZXhwIjoxNzUyNDI4MTQ5LCJpc3Mi
OiJteVN5c3RlbSIsImF1ZCI6Im15VXNlcnMifQ.
usNf4tLeyrFgMMSXx8iDM7KruGI5dI8RecubG3yCGRM",
"username": "poc_user",
"role": "POC",
"expiresAt": "2025-07-13T23:05:49.6385411+05:30"
}



- **Admin token:**

  It gives 401 Unauthorized error.

- 

Points Found

- **JWT tokens** expire in 10 minutes (2 minutes for short token)
- Used `Bearer [token]` in the `Authorization` header generated automatically by keeping bearer token with token in the box.
- Role-based access via `[Authorize(Roles = "RoleName")]`
- The **security key** must be identical in both `Program.cs` and `AuthController`.