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JAVA Booklet

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Notes for assignments:

- Make assumptions wherever necessary, and mention the same against the question.
- Use Exception Handling wherever required.
- Paste the solution application on the share folder (information will be provided during training).
- Submit the assignments on time.
- Follow the java coding standards :

Introduction to Java

Agenda

- History of Java
- Features of Java
- Data types in Java
- Access modifiers
- Writing First Java Class
- Accessors and Mutators
- Constructors
- 'this keyword

Assignments
Assignment #1 Write first java program
Assignment #2 Write a program to print size of different data types in java
Assignment #3 Write a program to demonstrate different access modifiers
Assignment #4 Create account class with different types of constructors

Fundamentals of Java : 1

Agenda

- Variables in Java
- static' keyword
- Memory layout
- Concept of Garbage Collector
- Parameter Passing (Call By value and ref)
- Arrays In Java
- Enhanced for loop
- Packages In Java

Assignments

Assignment # 1

Create a class Employee & write Accessors & Mutators
Create objects with default constructor & set values using mutators.
Display/print values of attributes of each object created.

Assignment # 2

Write a class Date. Overload constructor to initialize attributes.
Create Date objects using non-parameterized & parameterized constructors both.
Print values of day, month & year for every object.

Assignment # 3

Write a Java program that reads an integer between 0 and 1000 and adds all the digits in the integer.

Test Data

Input an integer between 0 and 1000: 565

Expected Output :

The sum of all digits in 565 is 16

Assignment # 4

Write a Java program to break an integer into a sequence of individual digits.

Test Data

Input six non-negative digits: 123456

Expected Output :

1 2 3 4 5 6

Assignment #5

Write a Java method to display the middle character of a string.

Note: a) If the length of the string is odd there will be two middle characters.

b) If the length of the string is even there will be one middle character.

Fundamentals of Java : 2

Agenda

- Date time class in java 8
- Static import
- Packages

Assignments

Assignment # 1

Write a Java program to get the last date of the month also get current full date and time.(use java 8 date time api)

Assignment # 2

Create an array of Employees & display nos. of Employee objects created.

Assignment # 3

Create a class Calc inside a package "utility". This class will have a method findRoot() which will return the square root of a given number.

Create another class User1 inside a package allusers. User1 calls the method findRoot() to get square root of a number.

These two packages should be in different directories on two different drives. (may be C: & D:)

Assignment # 4

Write a Java program to insert an element (specific position) into an array.

Assignment # 5

Define variables in class using static method initialize these variables and display.

Assignment # 6

Write a program to calculate area of triangle. Use PI value using static import

Assignment # 7

Write a program to demonstrate package scope

#Comments

Write Singleton class (Note – We can create Only one object of such a class).

Write a program to find smallest and largest element in the given array.

Write a Class Circle and call the getPI() static method by using static import.

OOPs Concepts

Agenda

- Need of OOP
- Procedural vs OOP language
- Object characteristics
- Major Pillars of OOPS
- Inheritance and Polymorphism(Dynamic Binding)
- Abstract classes and Interfaces(Functional Interfaces)
- Object Class
- Functional interface
- Lambda Expression

Assignments

Assignment # 1

Create a class hierarchy: Employee

Manager

SalesManager

Override calculateSalary() method. Manager will have allowance field & SalesManager will have commission field.

Assignment #2

Create a class: Bank Account

Create subclasses: 1. Saving & 2.Current

Rate of interest is different for different types of account.

Assignment #3

Write a program to create a class named EmployeeDetails and display a menu similar to the following menu:

-----Menu-----

1. Enter Data
2. Display Data
3. Exit

Choose the option

Thereafter, invoke the respective method according to the given menu input. The methods will contain appropriate message, such as the displayData() method will contain the message, displayData method is invoked

Assignment #4

Write a program to understand predefined functional interfaces. Implement using anonymous classes

Assignment #5

Write a functional interface for arithmetic operation. Implement functional interface using lambda expression for different operations.

Abstract classes & Interfaces

Agenda

- Abstract classes
- Interfaces
- Difference between Abstract Classes & Interfaces

Assignments

Assignment # 1

Create a class hierarchy :

```
graph TD
    Animal --> Cat
    Animal --> Dog
    Animal --> Lion
```

Animal class will have methods like `respirate ()` & `talk()`
Override method `talk()` from Animal class in its each subclass
Create an array of Animal references & observe dynamic polymorphism

Assignment # 2

Create a class hierarchy : Shape
 Rectangle Circle Triangle

Override method calculateArea() from Shape class in its each subclass

Create an array of Shape references & observe dynamic polymorphism

Assignment # 3

Create an interface: Printable – method print()
Write a class Utiltiy to have a method printAll(Printable [])
Pass different objects (Shapes & Animals) to printAll() to print them.

Assignment # 4

Create a bank and insurance interface. Create HDFC and ICICI as abstract classes implementing common features. Instantiate HDFC and ICICI bank

Java Miscellaneous

Agenda

- Object class
- Garbage Collector
- Wrapper classes
- Auto boxing & unboxing
- Annotations

Assignments

Assignment # 1

Override equals(),toString() in Employee & Account class

Assignment # 2

Call System.gc(), check whether GC runs or not

Assignment # 3

Accept numbers from command line arguments & sort them

Assignment #4

Override the toString method of the Object class in the Employeeclass and in the Manager class. You will create an EmployeeStockPlan class with agrantStock method that uses the instanceof operator to determine how much stock togrant based on the employee type.

#Comments

Create object cloning of associated classes i.e Employee has an Address.(Override the Clone method of Object Class).

Create a Simple Calculator application. Get all the numbers through Command line arguments and use Wrapper Class Conversion method to calculate the result.

Exception Handling

Agenda

- What are Exceptions ?
- OOP way of Exception Handling(try,catch,finally)
- Types of Exceptions
- Multicatch and ARM - Automatic Resource Management
- User Defined Exceptions (throw and throws keywords)

Assignments

Assignment # 1

Write a program to demonstrate the use of try, catch, finally throw and throws keywords and demonstrate the following points in the program.

- a) Multiple catch blocks.
- b) try-catch-finally combination.
- c) try-finally combination.
- d) Exception propagation among many methods.
- e) Use of getMessage(), printStackTrace() function of Throwable class.
- f) Nested try blocks

Assignment # 2

Create a NegativeNumberException to be thrown by the method findSqrRoot() if user enters a negative number.

Assignment #3

1) Create an employee class with relevant information like name, id, salary and create employee objects.

2) Create Customer class with relevant information like name, address, account number, current balance. Create BankApplication class and add customers to the bank application with relevant methods like addCustomer, deleteCustomer, updateCustomer and getCustomerInfo etc.

3) Create Account class with account type, account number, minimum balance and current balance and provide corresponding getter and setter methods along with calInterest method. Create FixedDepositAccount, CurrAccount classes and inherit methods from Account class. Use Account class in Customer class to store account information in the customer object.

4) Create InsufficientBalance exception class and use it appropriately in Account class.

5) Query BankApplication Object and display existing customer names.

Comments

Write a File Handling Application to Write data inside file by using PrintWriter and Use Try With Resource.

Collections & Generics

Agenda

- Concept of Generics
- Wrapper Classes
- Need of Collections
- Collection Hierarchy
- List
- Set
- Iterating Collection (traditional and Java 8 ways)
- Sorting In Collection (Comparable and Comparator interfaces)
- Map - (HashMap ,TreeMap)
- Java 8 - Stream API in Collection

Assignments

Assignment # 1

Create a sorted set of Employee objects.(Sort on Emp ID)

Assignment # 2

1. Create a list of Employee objects & sort them *by names* in alphabetical order (may be same as above.)
2. Create a user defined exception to check whether your employee exist in your data structure (use any data structure to store the employees - like array, ArrayList etc) and throw exception if name is not in the employees list. Use the catch and finally block to make an appropriate.

Assignment # 3

Create a HashMap for books & no.of pages.

Display contents of Map using iterator. (Where Book is a class)?

(Override equals() & hashCode() in book class. .note:equal s/hashcode contract should not be violated)

Assignment #4

1) Create **Customer** class with the following methods.

private String custName = null;

private int ACC_NO = 0;

private Hashtable accountInfo = new Hashtable(); - Key can be one of SB_ACCOUNT or CURR_ACCOUNT defined

void depositAmount(int ACC_TYPE, int amount) - Deposit amount into the corresponding account type.

void setCustomerName (String name) - Set the customer name

String getCustomerName () - Get the customer name

int getAccountNumber() - Get the account number

void setAccountNumber(int accno) - Set the account number

2) Create **BankApplication** class with the following methods.

private Hashtable customerInfo = new Hashtable() - Add new customer by taking his name as key and object

reference as value

addNewCustomer(Customer cust) - Add new customer to the bank application.

public void depositAmount(String name, int ACC_TYPE, int amount) - Add amount to the corresponding customer's account

3) Create a controlling class named **BankingOperation** with main method and accordingly instantiate objects of above classes.

This class should be outside the above package.

IO, Serialization & Networking

Agenda

- Concept of Streams
- Binary Streams vs Character Streams
- File - Reading and Writing
- Serialization and De-Serialization
- Concept of Layering Streams
- New File System API(NIO)
- Networking -Client Server Computing
- TCP/IP Sockets (Socket, ServerSocket and port number)

Assignments

Assignment # 1

Read input data from keyboard & write it to a file "File1".
Copy contents of File1 to File2.

Assignment # 2

Serialize & deserialize Account object which will have
a Date type of field : doc (date of creation)

Assignment # 3

Create a simple chat application (Client-Server)

#Comments

Create multi-client socket application where multiple Client can access Date & Time Server which provides Date and Time of the Server Location.

Multithreading

Agenda

- What is Thread ? Why Threads ?
- Thread Scheduling (Concept of Context Switch)
- Ways of creating threads in Java
- Thread lifecycle and methods
- Thread Synchronization
- Inter-thread communication (wait, notify and notifyAll methods)
- Executors, Tasks, ForandJoin, Futures

Assignments

Assignment # 1

Two members of a joint Account are trying to withdraw Rs.3000 from the account simultaneously & balance is Rs.5000.

Create a multithreaded program to handle this situation

Assignment # 2

Write a program to demonstrate executor services .(check number of thread created)

#Comments

- Create GUI application to move Strings from opposite directions.
- Create an application wherein you have to create 3 different threads accessing a resource called Table i.e class , which has a method called printTable and use synchronizaion to display 5, 10 and 100 tables respectively.

JDBC

Agenda

- File vs RDBMS
- What is JDBC ?
- Driver Types in JDBC
- Basic Steps in Using JDBC
- JDBC Architecture

Assignments

Assignment # 1

Insert & update Employee data in database & display it using Prepared Statement.

Insert some records in Student Table

Assignment # 2

Create a stored procedure for updating the basic salary of employees as 10%HRA should be added to basic salary .

Assignment # 3

Write generic code to display column names of a table along with data in the table (same code should work to display records from Emp table and then for Student table

#Comments

- Write a transaction management application where you have to create two Accounts
From and To resp. and transfer the money from one account to another, use commit and rollback functions for transaction management.
- Which method we should use when we don't know the query i.e either it can be select or insert, find the method and get the query input from the user and perform select and insert operations on that table.

New features in JAVA 9 and 10

- The Java Platform Module System
- Jshell : The interactive Java REPL
- Stream API Improvements
- private interface methods
- Local variable type inference

Assignments
Assignment # 1 Explore different jshell commands
Assignment # 2 Write a program to use factory Methods for Immutable List, Set, Map and Map.Entry
Assignment #3 Write a program to understand module system in java 9

JEE OVERVIEW

Agenda

- N tier Architecture
- JEE Overview
- Web Applications

Servlets Intro

Agenda

- Introduction to JEE
- Introduction to Servlets
- LifeCycle of servlets
- Servlets Collaboration
- Request Dispatcher
- Session Management

Assignments
Assignment # 1 Create a simple servlet to print Hello message with User's name
Assignment # 2 Create a simple servlet demo to demonstrate Servlet's Life cycle
Assignment #3 Create a servlet for login form that accepts username and password respectively

Servlet Features

Agenda

- Servlet Config
- Servlet Context
- Request Dispatcher

Assignments

Assignment #1

CybageNet with BooksReview

1. CybageNet Login:
 - a) Administrator Login
 - b) User Login
2. Library System:
 - a) Administrator can do following:
 - Insert books into database
 - Remove books from database
 - b) User can do following:
 - Book search (based on Title)
 - Show Details of the selected book (Including reviews)
 - add a review

#Comments

- Create a form which has two input fields to get two numbers and after pressing Add button calculate the result on first servlet class and use RequestDispatcher to display the result on second servlet.

Session Tracking

Agenda

- Hidden Form Field
- URL Rewriting
- Cookies
- Http Session

Assignments

Assignment # 1 (continue with BookReview assignment)

Administrator should be able to check how many users are logged in simultaneously.

Assignment # 2

Use cookies to show no. of visitors to the site.

#Comments

- Create a form which accepts Product Details i.e. id , name, and price and set the details in Product model object and put it in a session and display it on the 2nd Servlet Page
- One the 2nd Servlet page create a link logout once user presses that logout button user should navigated to UserLogoutServlet where user should see a message as you have logged out successfully.

Servlet Filters

Agenda

- Filters Introduction
- Filter Demo

Assignments	
Assignment #1 (continue with BookReview assignment)	
Create a simple logging filter to log the information about Login timings of the users	
#Comments	
<ul style="list-style-type: none"> Create a student registration form and using ValidationAndRendering Filter class Apply blank field validations and if all the fields are valid then show the response rendered in a table where rendering part will also come in the same filter class. 	

JSP Intro

Agenda

- Introduction to JSP
- JSP Lifecycle
- JSP implicit objects
- JSP Directives

Assignments

Assignment #1

Replace servlets by JSPs in BookReview assignment

(Example: Login & Books details page)

JSP and JSTL

Agenda

- Introduction to JSTL
- JSTL usage

Assignments

Assignment #1

Continue with JSP BookReview assignment.

Create JavaBean for Book (BookBean) & Use useBean standard action

Assignment #2

Using Java Bean Book create a list of objects and set some attributes that will be used in the JSP. JSP page will show how to iterate over a collection, using conditional logic with EL and some other common usage.(hint: JSTL Core Tags)

#Comments

- Create a Sportsman Info Form where you have to accept player name, game and place of birth and date of birth and insert it inside the Player Bean by JSP Standard actions and display it on the third jsp page.

Introduction to Spring Framework

Agenda

- Introduction to Spring
- Spring Modules
- IoC (Dependency Injection)
- Beans and Lifecycle of Bean
- Steps to create Spring Application
- Types of Dependency Injections

Assignments

Assignment #1

Create a Maven project to build a Spring Based application.(work on the pom.xml)

Spring Core Features 1

Agenda

- Beans Lifecycle
- Beans Scope
- Types of dependency injections

Assignments

Assignment #1

Create a Spring based app where the bean “**OutputHelper**” declared in ‘Spring-Common.xml’ can access to other beans in ‘Spring-Output.xml’ – “**CsvOutputGenerator**” or “**JsonOutputGenerator**”, by using a ‘ref’ attribute in property tag.

Try to implement the same keeping all bean in same file.

Assignment #2

Create a User bean class with name ,city, country field and use the setter injection to inject the value also implement the constructor injection in the same example.

#Comments

Create a simple spring maven application to create two beans Circle and Rectangle which are implementing Shape interface which has area and perimeter abstract methods, calculate both the area and perimeter of the shapes by coding through interfaces concept.

Spring Core Features 2

Agenda

- Collections
- Factory Pattern.
- Spring Annotations

Assignments

Assignment #1

Create a Spring Core application for Forum where **One question can have multiple answers.**

1. **Question.java**
2. **applicationContext.xml**
3. **Test.java**

Use any collection element to store the multiple answer.(list,set,prop)

Introduction to Spring MVC

Agenda

- Spring MVC architecture
- Components in Spring MVC
 - Model
 - Controller
 - View Resolver

Assignments

Assignment #1

Create simple Spring MVC supported **employee management application** having only one feature i.e. list all available employees in system.

All Employees in System

Employee Id	First Name	Last Name
1	Lokesh	Gupta
2	Raj	Kishore

Spring MVC Form Handling

Agenda

- Spring MVC Form Handling
- MVC Annotations

Assignments

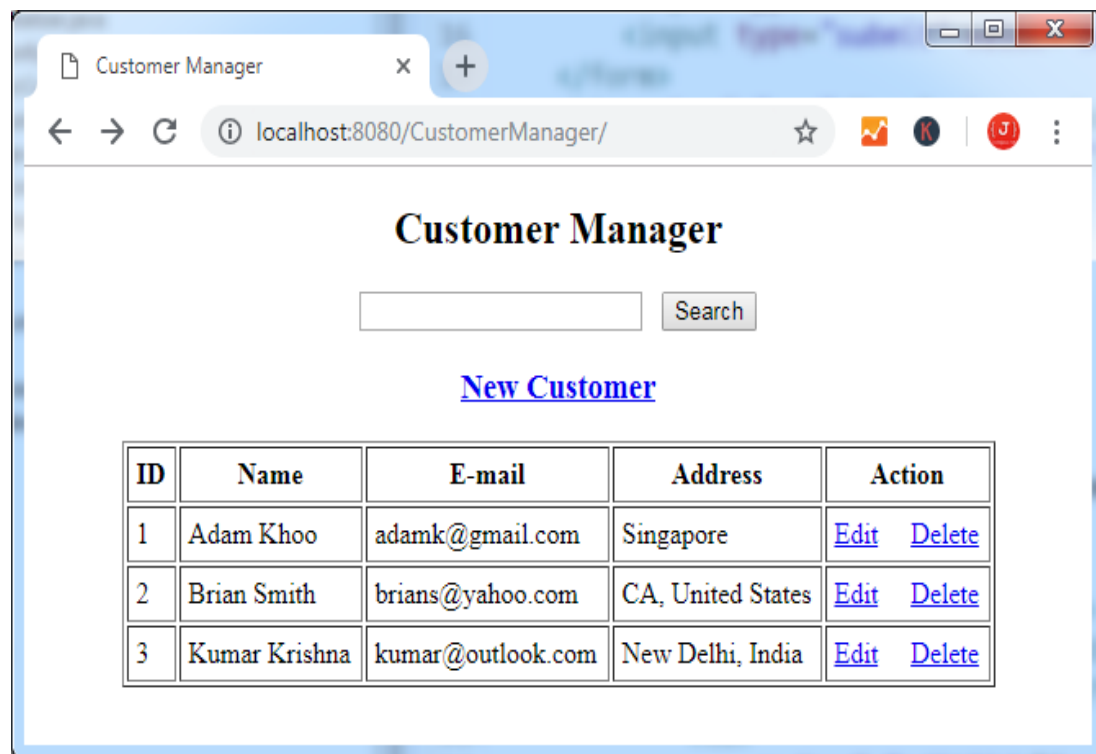
Assignment #1

Continue the above the example by creating form to accept the employee details and then display the list of employee.

Create a Spring Boot + MVC Application to Manage Customer Entries
In a XYZ Company. Perform all the CRUD Operations and also provide search customer functionality (i.e. By Id). Please find below Snapshot.

Note –

1. Please Use Proper Coding Conventions.
2. Use Comments whenever it is necessary.



Introductio to JPA

Agenda

- JPA Architecture
- ORM Architecture
- JPA Provider

Spring with data JPA

Agenda

- Spring data JPA
- Configuration
- Demo

Assignments

Assignment #1

Create a PersonRepository(Id,Name,Address,ContactNo,Age) to perform the following operations :

1. Save the person record
2. Search a record by PK
3. Delete a record
4. Update the record.

#Comments

- Create the same customer application by adding JPA

REST API Introduction

Agenda

- Introduction to WebServices
- REST vs SOAP

REST with Spring

Agenda

- Resource Methods
- Spring-Rest Architecture
- Annotations

Assignments

Assignment #1

Write REST API for CRUD operation for Employee Management System.
(GET,PUT,POST,DELETE) using Spring MVC.(Bonus point to implement RestTemplate API)

New Features in Spring 5

Agenda

- Support Java 8, Java EE 8, Servlet 4.0, Bean Validation 2.0, and JPA 2.2, JMS
- Improved Logging with new module – spring-jcl
- File operations are using NIO 2 streams, hence improved performance
- Support for Kotlin, Project Lombok, JSON Binding
- Spring WebFlux – Spring getting Reactive
- Support for JUnit 5

Spring security

Agenda

- Introduction to Spring Security
- Spring Security
- Demo

Assignments
Assignment #1 Create simple spring based application with login and logout feature
Assignment #2 Create simple spring based application with login and logout feature (fetch user data from database using JDBC)
Assignment #3 Create simple spring based application to check method level security

Spring cloud

Agenda

- Introduction to Spring cloud
- Different tools in spring cloud
- Demo

Assignments
Assignment #1 Microservice registration and discovery using Netflix Eureka
Assignment #2 Simple microservice to demonstrate Zuul gateway

JUNIT

Agenda

- Why Testing?
- Old Way Vs New Way
- Terminology
- Assert Methods
- Overview

LOG4J

Agenda

- Need Of Logging
- Components of Log4J
- Levels of logging
- Configuration

Declaration by the Participant

My Understanding

Name:					
Employee ID:					
Sr. No	Topic	Theoretical	Practical		
		Yes	No	Yes	No
1	Introduction to Java and Object Oriented Programming Concepts				
2	Basics of Java (Arrays)and Inheritance				
3	Abstract Classes and Interfaces				
4	Exception Handling				
5	Collections Framework				
6	Generics				
7	Multithreading				
8	Synchronization				
9	IO, Serialization and Networking				
10	Basics of MYSQL(Command Line)				
11	JDBC				
12	JAVA 7 new Features				
13	JAVA 8 (Functional Programming)				
14	JAVA 8				
15	Introduction to Java EE, Basics of Servlet & its Lifecycle				
16	Servlet features (Context, Config)				
17	Servlet filters				
18	Session tracking				
19	JSP basics & scripting				
20	JSP standard actions				
21	JSTL				
22	Spring Framework Introduction and IOC/DI Container (First Application)				
23	Spring Core (Dependency Injection)				
24	Spring Core(Collections and Factory Pattern)				
25	Intro to Spring MVC				
26	Spring MVC Form Handling and Annotations				
27	What is JPA				
28	Spring with JPA(Spring Data)				
29	REST Introduction				
30	Spring with REST				
31	Spring security				

32	Spring cloud				
33	New Features in Spring 5				
34	JUNIT				
35	LOG4J				

Signature of Participant

For Office Use:		
Signature of Trainer	Signature of Evaluator	Signature of Training Head