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JAVA QUESTIONS

1. ARRAY –
   COVID Vaccination drive has started in Maharashtra. Take input from user for the name of districts, the number of vaccination centres in that district people registered for vaccination. and store in a 2D array. Create a jagged array in which each row is a district and columns is number of vaccination centres in which maximum 40 people can be vaccinated per day. Display the number of people allotted to each vaccination centre and check if all people registered on that day were vaccinated or not.

   Example :

District	Number of vaccination centres	Number of people registered
Nagpur	5	100
Mumbai	10	500
Pune	3	120

   Output :
   Nagpur : 40 40 20 0 0
   Mumbai : 40 40 40 40 40 40 40 40 40 40
   Pune : 40 40 40
   Only 400 people were able to vaccinate in Mumbai and 100 people were left. Nagpur had 3 centres free on that day.

2. STRING –
   Rushabh was solving questions on palindromes. He has n distinct strings of equal length m. He wants to make the longest palindrome possible concatenating as many strings as possible. Write a Java program given the values of n, m, and the strings and print the longest palindromic string possible.

3. INHERITANCE –
   Create a class Student to store the name, register number, email and proctor name of the student. Create another class Marks that inherit the student class and stores all the CAT1, CAT2, Quiz 1, Quiz 2, DA1, and FAT marks of the student. Create another class Result that inherits the marks class and has methods to calculate the average and SD of the class. Initialize all classes with appropriate constructor. Determine the grades of the student according to grading system based on average and SD.

4. INTERFACES –
   Create interface security with the data member length to be fixed initially. Declare new function such as encrypt(string) and decrypt(string). Create another interface call stringfun which is inherited from the interface security. Create a class pwdCheck that reads the input and converts it to the encrypted form and vice-versa.

5. PACKAGES –
   Rushabh was learning Pythagorean Theorem of right angle triangle with side a,b,c satisfying the formula $a^2 + b^2 = c^2$. However during his exam, he forgot the actual formula and found the Pythagorean triplets using the incorrect formula, $c = a^2 - b$. Given an integer, n, find the Pythagorean triplets such that $1 \leq a \leq b \leq c \leq n$ and they satisfy both the conditions. Within the package 'correctformula', define a class with method to calculate all the correct Pythagorean triplets. Define another class 'rushabhformula' outside of this package to check the if the correct triplets also satisfy his condition. Print them.

   Example : (a,b,c) = (3,4,5).
   Here, $3^2 + 4^2 = 5^2$ and also $5 = 3^2 - 4$

6. USER – DEFINED EXCEPTIONS :
   Create a class by name Employee with members – Employee ID, Name and year of birth. The Employee ID is a string that contains the ID in the format year-designation-number. The year is represented with the last two digits. The designation is a single letter code - 'F' for faculty and 'S' for staff. The number is a 3 digit number.
   (Example: 81-F-112 55-S-254)

Write a program to read the employee details and validate the employee code. If the employee code is incorrect throw a user-defined exception "InvalidEmployeeCode" else create the Employee object and display the details of the employee. Also check if the employee is over 65 years of age, he needs to retire and a bonus equal to his $age \times number\ on\ his\ ID$ will be given to him from the company.
Example : The employee 55-S-254 must retire since his current age is 66 and bonus of (66*254) 13,970 will be given to him.

7. INTER – THREAD COMMUNICATION –
   COVID cases are increasing day by day. A new hospital has been inaugurated with maximum capacity of 20 beds with all required facilities. Patients are admitted into the hospital subject to availability of beds. Doctors treat the patient and they are discharged after testing COVID negative. If there are no patients, Doctors wait for new patients to arrive. Write a Java program to illustrate the given scenario using multithreading.

8. SERIALIZATION –
   Hostel counselling is going to start at VIT university. Hence all the students will be ranked as per the NCGPA and called for hostel counselling.

$$NCGPA = \frac{Your\ CGPA}{Topper\ CGPA} \times 10$$

   Write a Java program to create a class Student with Registration number, name, CGPA and Proctor Name as its data members. Create ‘n’ objects of this class for all the students in the university. Write these objects into a file. Store the state of objects of this class in a file. Read these objects from the file and determine the NCGPA of each student and rank them from first to last.

9. Assume only a maximum of 3 placement offers can be given to a student through PAT office. Create a hashmap ‘jobOffers’ with ‘n’ key-value pairs where keys are the names of students and values are companies placed in. Create another hashmap ‘packages’ with ‘m’ key-value pairs where keys are the names of companies and value is the CTC offered by

it. Populate the hashmaps with appropriate user inputs and write appropriate code to

a. Add or remove a student from 'jobOffers'
b. Iterate over the maps and display the key-value pairs stored in them
c. For every student name, fetch the offers given to him and display the company of highest offer given to the student

if the elements of 'jobOffers' are

Student	Companies
Rushabh	Microsoft, Oracle
John	Google, Facebook, Microsoft
Charles	JP Morgan, Microsoft

and if the elements of 'packages' are

Companies	Package Offered
Microsoft	44,00,000
Oracle	25,00,000
Google	78,00,000
Facebook	32,00,000
JP Morgan	15,00,000

For the student "Charles", the offers are from JP Morgan of 15,00,000 and from Microsoft of 44,00,000. He will choose Microsoft offer.
Also calculate the average CTC of placements

10. GENERIC CLASSES AND METHODS –
    Write a Java program which alters the list according to the specific conditions which the array stores. If the array stores strings, reverse all those elements of array that are not palindrome and add a * to the palindromic strings. If the array stores integers, replace all the prime numbers in the array with its square.

11. GUI WITH JavaFX –
    Winter Semester results are going to be released and COE has to calculate the total marks of students in different courses. There are four different types of courses along with weightage is given below :

- TH – Theory Only (100%)
- LAB – Lab Only (100%)
- ETL – Theory (75%) + Lab (25%)
- ETLP – Theory (50%) + Lab (25%) + Project (25%)

Develop a GUI with menu and menu items corresponding to the four different courses and teacher must be able to enter the marks of

- CAT 1, CAT 2, Quiz 1, Quiz 2, DA 1, FAT in theory component
- 3 Lab assessment, 2 LabCATs, LabFAT mark in lab component
- Review 1, Review 2, Review 3 marks in project component

Use buttons, text fields and event handlers.

12. POLYMORPHISM –
    Create an abstract class Hospital which contains the following for a hospital : Name, Type(Government, Private), Code, Email. Then implement an abstract method which determines the amount to be paid by a patient to the hospital which varies between government and private hospitals. For Government hospital the ward cost is flat 5000 Rs and treatment cost is flat 2000 Rs. For private hospitals, ward cost is 500 Rs/hour and treatment cost varies according to treatment (take input from user). Create two child classes GovernmentHospital and PrivateHospital. Write a Java program by creating objects of the two child classes and display the bills details accordingly.

13. FILES AND STACK OPERATION TO EVALUATE EXPRESSION –
    Write a program that reads an expression from the file and split the operands and operators into the two separate files. Count the number of operands and operators and write it in the respective file in which they have been split and evaluate the expression.

14. SYNCHRONISATION –
    VIT academics department has decided to change the type of JAVA PROGRAMMING course based on student demands. The options given are to convert the course into “Lab – only”, “Embedded Theory, Lab and Project” or “Embedded Lab and Project”. You have been given the

task to count the student votes for each type. With the total students of 2000 people in Computer Science branch, simulate the vote casting by generating 2000 random numbers (1 for lab - only, 2 for theory – lab – project and 3 for lab – project) and store them in an array. Create four threads to equally share the task of counting the number of votes. Use synchronization to update the three count variables. The main thread should receive the final count for all three types and hence decide the new type of the course based on the values received.

15. LAMBDA EXPRESSION TO TRAVERSE ARRAY, LOOPS, INPUT FROM COMMAND LINE ARGUMENTS –

    Prof. Jaisankar has recently enabled marks on codetantra and is now receiving doubts from some students for re-evaluation. On day i, he receives Qi queries. But due to other academic work, Prof. Jaisankar can answer at most k queries in a single day.

    He always answers the maximum number of questions that he can on any given day (note however that this cannot be more than k). The remaining questions (if any) will be carried over to the next day. Fortunately, after n days, the queries have stopped and all the doubts are cleared. Prof. Jaisankar would like to know the first day during which he has some free time, i.e. the first day when he answered less than k questions. Use lambda function in this Java code.

    INPUT : (given as command line arguments, Q1 Q2 Q3 ..... Qn K).

    OUTPUT :
    1st day when Prof. Jaisankar is free