

CBCS for PG (SEM-III) EXAMINATIONS - 2019
Advance Problem Solving using Java Programming

12-02-2020

Max Marks: 75

Time: 2 Hours

- Write your Roll No. on the top immediately on receipt of the question paper.
- Attempt ALL questions by selecting any TWO parts. All questions carry equal marks.

1. (a) What is Ragged Array? Illustrate with a program example. Also explain the syntax and application of for-each loop in Java.
- (b) What is the role of `rt.jar` file in Java? Explain the functions of the following Java command-line tools: `javap`, `javadoc`, `jar`.
- (c) Explain the function of `instanceof` operator with an example. What is the output of following Java program:

```
class SemesterExam {
    public static void main(String args[]) {
        System.out.println(20>>2); ~10
        System.out.println(-20>>2);
    }
}
```

2. (a) What is an abstract class? How is it different from interface? Explain with example.
- (b) What is Java Reflection? How is it useful? Explain with suitable example.
- (c) Design a class `Account` in Java consisting of `accountNumber`, `customerName`, `Address`, `city`, `mobile`, `email` and `accountBalance` with necessary parameterized constructors and getter methods. Demonstrate the working of the class in the main program.
3. (a) What is generic programming? Write a generic search method to perform a linear search in a given array type.
- (b) Compare and contrast among `StringBuffer`, `StringBuilder` and `StringTokenizer` string handling classes. Write a program to tokenize the names of the publishers from the following sentence: "Oxford University Press, Cambridge University Press, Springer-Nature, Elsevier, TMH, Pearson's"
- (c) Define a generic class to maintain a two-dimensional array of generic types. The size of the array is passed through constructor, which also performs necessary memory allocation. The class contains a method `genericSum()` that returns the summation of the array. Test the working of the above class in the main program on different types of data (such as integer, floating point).
4. (a) Write a short note on Collection framework. How a Map is different from Collection interface?
- (b) What is a daemon thread? How can we alter the priority of Java thread? Describe with example(s).
- (c) Write a Java program to create a thread which generates a unique serial number starting from 1 and goes up to 10,000. If an upper limit is reached, the counter is reset to zero. Demonstrate the working of the thread in the main program.
5. (a) What are different swing components? Explain any one with example. Also depict AWT Event hierarchy with a neat diagram.
- (b) Differentiate between `Statement` and `PreparedStatement`? How transactions are handled using JDBC APIs?
- (c) A librarian wanted to digitize the book stock register and willing to store information such as `AccessionNo`, `Title`, `Authors`, `Publishers`, `Price` and `NoOfCopies` to a database. Write a Java program which accepts these information from the user, connect to the database and store it to a database table. Assume that table scheme already exists within the database. Make necessary assumptions about database driver.



06-12-19

Code: CBSE32

Roll No: 1801A057

MCA (SEM-III) EXAMINATIONS - 2019
Database Management System with Oracle based programming

Time: 2 Hours

Max Marks: 75

- Write your Roll No. on the top immediately on receipt of the question paper.

- Attempt ALL questions by selecting any TWO parts. All questions carry equal marks.

1. ~~(a)~~ Define the following terms: database, DBMS, DBA. What are the characteristics of the database approach?

(b) Describe the three-schema architecture. Why do we need mappings among schema levels?

(c) Explain domains, tuples and relations in RDBMS. What is the difference between a database schema and a database state?

2. ~~(a)~~ Define the following terms: composite attribute, multi values attribute, relationship instance and complex attribute. Explain with suitable examples.

~~D.N.D~~ (b) What are the main symbols used in the E-R diagram? Make the E-R diagram of a Bank database.

(c) Explain disjointness and completeness constraints on specialization. What is the difference between specialization hierarchy and specialization lattice?

3. ~~(a)~~ Discuss the entity integrity and referential integrity constraints. Why each is considered important?

~~(b)~~ Given two union compatible relations R and S, define the three operations UNION, INTERSECTION and Set DIFFERENCE on them.

(c) Consider the schema diagram for the COMPANY relational database schema.

EMPLOYEE (Fname, Minit, Lname, SSN, Bdate, Address, Sex, Salary, Super_ssn, Dno)

DEPARTMENT(Dname, Dnumber, mgr_ssn, Mgr_start_date)

DEPT_LOCATIONS(Dnumber, Dlocation)

PROJECT(Pname, Pnumber, Plocation, Dnum)

WORKS_ON(Essn, Pno, Hours)

DEPENDENT(Essn, Dependent_name, Sex, Bdate, Relationship)

Write queries for the following:

- Retrieve the names of all employees in department 5 who work more than 10 hours per week on Project X.
- Retriéve the average salary of all female employees.
- Find the names of all employees who are directly supervised by 'John'.
- List the names of all employees who have a dependent whose names start with 'A'.

4. ~~(a)~~ What is the PL/SQL code block? What are the advantages of using PL/SQL? What are the differences between SQL and PL/SQL?

4. (b) For the following table write queries as per the questions:

Table name: Client_master

Column Name	Data Type	Size
Client_no	Varchar2	6
name	Varchar2	20
City	Varchar2	15
pincode	number	8
state	Varchar2	15
Bal_due	number	10,2

Data for client_master:

Client_no	name	city	pincode	state	Bal_due
C00011	Ivan	Delhi	400054		15000
C00012	Vandana	Madras	780001	Tamil Nadu	0
C00013	Pramala	Bombay	400057	Maharashtra	5000
C00014	Basu	Delhi	100045		2000

- (i) Retrieve the list of names and the cities of all the clients.
- (ii) List all the clients who are located in Delhi.
- (iii) Change the bal_due of client_no 'C00011' to Rs. 100.
- (iv) Add a column called 'telephone' of data type 'number' and size = '10' to the client_master

5. (a) Explain the various cursors found in Oracle.
5. (b) Define Boyce-Codd normal form How does it differ from 3NF? Why is it considered a stronger form of 3NF? Prove that any relation schema with two attributes is in BCNF.
- (b) What is Functional Dependency? Explain the second normal form with a suitable example.
- (c) Consider the following relation:

TRIP(Trip_id, Start_date, Cities_visited, Cards_used)

This relation refers to business trips made by company salespeople. Suppose the TRIP has a single Start_date but involves many Cities and salespeople may use multiple credit cards on the trip. Make a mock-up population of the table.

- (i) Discuss the FDs and/or MVDs which exist in this relation.
- (ii) Show how you will go about normalizing the relation.

Time: 2 Hours

- Write your Roll No. on the top immediately on receipt of the question paper.
- Attempt any two parts from each question. All questions carry equal marks.

1. (a) Discuss precisely the facts and realities that must be well recognized for building quality end Software Product in order to meet the challenges of 21st Century.
 (b) Why does software project fail? Identify two prominent instances of software failures in recent years. Explain the root cause of their failure and the consequential impact.
 (c) Write a comparative note on any two prescriptive models. Elaborate with appropriate example.
 (d) Discuss briefly a process framework. Identify a set of actions for the 'communication' activity in a system of your choice. Define task set for any one of these actions.
 (e) Enumerate significant benefits of developing software in which quality is 'good enough'. Discuss the repercussions when we emphasize 'development speed over product quality' and 'quality over speed'.
 (f) How do you ensure the 'Goodness of a Process'? Discuss any one of the prominent industry standards that are used to assure its goodness and the quality of a software process.
 (g) Categorically distinguish between design and architecture of a system. Outline the essential considerations to be taken into account when you design a system. Precisely explain the importance of these considerations for producing high quality software product.
 (h) Briefly explain the process dimension that indicates evolution of design model. List all the Four elements of design model and describe any one of them.
 (i) What do you mean by 'refactoring the software'? How do you perform it? List some of its significant benefits.
4. (a) How can you sense that a software project is in jeopardy? List few of the prominent indicators for such a situation. Describe the approach that you as a manager would apply to prevent a S/W from failure.
 (b) Discuss the W⁵HH principle with the help of an example of system project. Outline and precisely elaborate key characteristics, which you will apply to effectively handle the project.
 (c) What do you look for when choosing Technical Leader to lead a software project? Discuss the key traits of effective project manager.
 (d) Why is the psychology of a testing person important? Explain. Write traits of both good and bad tester.
 (e) Differentiate between the following pair of terms, including their purpose and focus:
 - i) Verification and Validation
 - ii) Re-testing and Regression testing
 - iii) Structural Testing and Functional Testing
 (f) Why do you say that complete or exhaustive testing is possible but impractical? Considering a small program or flow graph, show and prove this fact to support your answer.

How what

Time: 2 Hours

- Write your Roll No. on the top immediately on receipt of the question paper.
- Attempt ALL questions by selecting any ONE part. Question 1 and 2 are of 9 and 6 marks respectively.

1. (i) Write a function of polynomial time complexity to convert a CNF-Boolean function into equivalent graph. Thereafter, write a program to read a CNF-Boolean function and check whether it is satisfiability or not by checking the corresponding graph having a clique of k vertices or not, where k is number of sum terms in the CNF-Boolean function.
- (ii) Write a function in polynomial time complexity to convert an undirected graph into equivalent CNF-Boolean function. Thereafter, write a program to read adjacency matrix of the graph and check whether it is having a clique of k vertices or not by checking the corresponding CNF-Boolean function's satisfiability, where k is entered by user.
2. (i) Write a program for Traversing Sales Person (TSP) problem using best first search branch and bound method.
- (ii) Write a program using single one dimensional array of minimum size to get binomial coefficient ${}^n C_k$ by using dynamic programming approach.
- (iii) Write a dynamic programming program for chained matrix multiplication problem to get the optimal order.
- (iv) Write a program to get minimum spanning tree of a given graph using Kruskal's algorithm.
- (v) Write an efficient program to print truth table of n Boolean variables.
- (vi) Write a program to multiply two square matrices of order 2^k using Strassen's matrix multiplication algorithm.
- (vii) Write a program to get Longest Common Subsequence of two given sequences using dynamic programming approach.
- (viii) Write a program to get minimum spanning tree of a given graph using Prim's algorithm.
- (ix) Write an efficient program to remove duplicate character from string and determine its worst case time complexity.
- (x) Write a program for 0-1 knapsack problem using dynamic programming algorithm.
- (xi) Write a program for n-queen problem using backtracking algorithm.
- (xii) Write an efficient program to remove multiple blank spaces from a given file and determine its time complexity.
- (xiii) Write a program to generate all valid shifts to match a pattern in a text using naïve algorithm.
- (xiv) Write a program for 0-1 knapsack problem using best first search branch and bound algorithm.
- (xv) Write a program for sum of subset problem using backtracking algorithm.
- (xvi) Write a program to generate the Huffman code for given list of characters and their frequencies.
- (xvii) Write a program for m-coloring problem using backtracking algorithm.



MCA (III SEM) EXAMINATIONS - 2019
Analysis and Design of Algorithm (Theory)

Time: 2 Hours

Max Marks: 75

- Write your Roll No. on the top immediately on receipt of the question paper.
- Attempt ALL questions by selecting any TWO parts. All questions carry equal marks.

1. (a) Write a mathematical equation to get the number of digits in factorial of a positive integer n and then write an algorithm to get the factorial of positive integer n, where intermediate and final results is stored in a one dimensional array. Derive the formula to get total number of multiplication (*) operations in this algorithm.

(b) State the master theorem and describe its regularity condition, with an example that violates the regularity condition.

(c) What is an indicator random variable? Let $X_{i,j} = I\{z_i \text{ is compared to } z_j \text{ in quick sort algorithm}\}$ is an indicator random variable, z_i is the i^{th} smallest number, and in partition operation the first element of the list is chosen as pivot item. Explain, for which of the following sequence the $X_{3,5} = 0$ and for which sequence $X_{3,5} = 1$.

- (i) 2, 5, 1, 3, 8, 7, 6, 4. (ii) 4, 5, 1, 3, 8, 7, 6, 2

(a) Describe the situation in which the dynamic programming algorithm is better over divide and conquer algorithm for a given problem. Write a dynamic programming and divide and conquer algorithms each to get the n^{th} Fibonacci number.

(b) Define the chained matrix multiplication problem and show that time complexity of the brute force algorithm of this problem is exponential. Determine the optimal order and its cost, using brute force algorithm, for the chained matrix multiplication problem $A_1 \times A_2 \times A_3$, if orders of these matrices are 20×2 , 2×15 , and 15×10 respectively.

(c) Discuss the prefix of a sequence with examples and write a dynamic programming algorithm to get longest common subsequence (LCS) of two given sequences.

(a) Discuss the greedy approach and show that it is unable to solve 0-1 knapsack problem.

(b) What is a minimum spanning tree? Let there is a complete graph K_5 whose vertices are $V = \{1, 2, 3, 4, 5\}$ and weight of each edge (u, v) is defined as $\omega(u, v) = \max(u, v)$. Compute the minimum spanning tree of this graph using Kruskal's algorithm.

(c) Define the scheduling with deadline problem. Suppose that the job number, deadlines, and profits of five jobs are given as below. Write all the feasible sequences and sets of these jobs.

Job#	1	2	3	4	5
Deadline	2	3	1	2	4
Profit	50	40	30	20	10

4. (a) What is n-queens problem? Write backtracking algorithm for this problem, and estimate its time complexity.

(b) Define m-coloring problem and explain how it is solved using backtracking algorithm with example.

(c) Let S be the set of first five prime numbers. Use backtracking techniques to find all sub sets of S whose sum should be equal to 7. Show pruned state space tree and actions step by step.

5. (a) Let there is a complete digraph K_7 whose vertices are $V = \{1, 2, 3, 4, 5, 6, 7\}$ and weight of each edge $\langle u, v \rangle = v$. To find optimal tour of this graph you may use branch and bound algorithm. Determine the total number of nodes, number of leaf nodes of corresponding state space tree, and compute the bound of the nodes: [1], [1, 3], and [1, 5, 3, 2].

(b) Define 0-1 knapsack problem and solve the following 0-1 knapsack problem using backtracking algorithm. Show action step by step.

P_i (Rs.)	1	1	1	4	
w_i (kg)	1	1	1	4	

(c) What is nondeterministic polynomial time (NP) problem? Show that Hamiltonian Circuit Problem and CNF Satisfiability Problem are in NP.



MCA (SEM-III) EXAMINATIONS - 2019
Computer Networks and System Administration

Time: 2 Hours

Max Marks: 75

- Write your Roll No. on the top immediately on receipt of the question paper.
- Attempt ALL questions by selecting any TWO parts. All questions carry equal marks.

1. (a) Explain the operation of the Token bus network and Token ring network.
(b) What is the layered architecture? What are the advantages of layered architecture? What do you mean by reliable transmission?
(c) Briefly explain the functions and services of various layers of the TCP/IP reference model.
2. (a) Enumerate in detail about the Cyclic Redundancy check algorithm with an example.
(b) What is collision? How does CSMA/CD detect and handle collisions.
(c) Explain in detail about the Ethernet-802.3 with its access protocol and addressing mechanism.
3. (a) What is the fragmentation in IP? Briefly explain process of fragmentation used in the IP (Internet Protocol).
(b) Enumerate in detail about the internet checksum calculation algorithm with an example.
(c) Illustrate the working of the shortest path routing algorithm.
4. (a) Write a short note on the connection establishment and termination using TCP.
(b) Illustrate the silly window syndrome and Nagle's algorithm.
(c) Explain the working of the sliding window protocol in detail with an illustration.
5. (a) Discuss the concept of the users and groups. Briefly explain the policies for access assignment and control used for users and groups.
(b) What is a firewall and firewall logs? Briefly discuss the different types of firewalls used in the computer networks.
(c) Write short notes on DNS. Discuss the two domains of the Domain Name Space.

- Write your Roll No. on the top immediately on receipt of the question paper.
 - Attempt ALL questions by selecting any TWO parts. All questions carry equal marks.
1. (a) Given that one of the roots of the non-linear equation $\cos(x) - x \cdot e^x = 0$ lies between 0.5 and 1.0. Find the root correct to three decimal places.
- (b) Write program in Fortran/R to find roots of system of Algebraic equation using any method.
- (c) Explain Algorithms of Jacobi and Gauss Seidel methods and make a comparison.
2. (a) Explain the Least Square Method. Determine the both regression lines for below data. Also, prove that they intersect at (x, y) .

X:	1.2	1.4	1.6	1.8	2.0	2.4
Y:	4.2	6.3	8.4	11.6	15.0	24.2

- (b) Derive formula for Simpson's 1/3rd Rule.

(c) Given the table of values as below. Find $y(2.35)$ and $y(2.60)$.

x	2.00	2.25	2.50	2.75	3.00
y(x)	9.00	10.06	11.25	12.56	14.00

3. (a) Explain the following terms with the help of suitable examples:-

- (i) Percentile and quartiles
- (ii) Mean, Median and Mode

(b) Write a Program in Fortran/R to calculate Mean, Variance and Standard Deviation.

- (c) Explain the different data representation tools and construct a histogram and frequency polygon for the following data.

100-150	150-200	200-250	250-300	300-350
4	6	13	5	2

4. (a) In an examination 30% of students have failed in Chemistry and 20% has failed in Botany and 10% have failed in both Chemistry and Botany. A student is selected random.

- (i) What is the probability that a student has failed in Chemistry if it is known that he has failed in Botany?
- (ii) What is the Probability that the student has failed either in Chemistry or in Botany?

- (b) Explain Probability and Conditional probability with the help of suitable examples.

- (c) Explain regression of y on x and regression of x on y. Also, Explain Least Square method.

- (d) What is ANOVA? Write steps for calculating one way ANOVA.

- (e) Applications of fertilizers were tested for the yield of rice grown in 10 plots. Another seed of 10 plots of similar size & condition were taken as control. Test the effect of fertilizer. Given $t_{tab}=2.10$.

Plot no	1	2	3	4	5	6	7	8	9	10
Fertilizer Applied	16	14	18	15	13	17	16	15	14	13
Fertilizer not applied	10	12	11	9	13	13	12	14	13	11

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- (f) Explain the following tests with the help of suitable examples:

- (i) Chi-square test

- (ii) T-test

$$P(C) = \frac{3}{10} \quad P(C \cap B) = \frac{1}{10}$$

$$P(B) = \frac{2}{10}$$

$$P(C \cup B) = P(C) + P(B) - P(C \cap B)$$

$$= \frac{3}{10} + \frac{2}{10} - \frac{1}{10} = \frac{4}{10} = 0.4$$

Solve any two

~~//~~ Q 1. Solve the following linear algebraic equations.

$$15x_1 + 4x_2 + 9x_3 = 15$$

$$5x_1 + 20x_2 + 3x_3 = 20$$

$$6x_1 + 3x_2 + 25x_3 = 16$$

~~Q 2.~~ Find the cube root of 47 using Newton-Raphson method.

~~Q 3.~~ Integrate the following using any method: $\int \frac{1}{(1+x^2)} dx$

Where lower limit= 0 and upper limit is 1.

~~Q7 - Q7 20
Date~~

~~Q7 Valb test
summers~~

Code: CSCC 35

SET- A

Roll No. 180161059

MCA (SEM-III) Lab- EXAMINATION – 2019, Computer Networks and System Administration

Write the source code, *compile*, and test the following program in one of the programming language of your choice:

1. To simulate the shortest path routing algorithm (Dijkstra).
2. To change an IP address in any notation to two other notations.
3. To find first and last address in a block given any addresses in the block and assuming classless addressing.
4. To find the class of a given address in dotted decimal notation.
5. Write a program to download a web page, that is, it prints the raw data located at the URL if the URL references an HTML file, the programs output is raw HTML.

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Set C 02/2020

CBCS for PG (SEM-III) EXAMINATIONS – 2019
CBCS31: Advance Problem Solving using Java Programming (Lab)

Time: 2 Hours

Attempt any ONE of the following:

1. Write a GUI application using swing that calculates the income tax of a person. The program takes annual income as input and computes income tax (IT) based on following criteria:

Income	Tax rate
0-2,50,000	Nil
2,50,001-5,00,000	5%
5,00,001 - 10,00,000	20%
Above 10 lakh	30%

2. Write a generic predicate search method which performs a linear search operation in a given array and returns true if found; otherwise it returns a false.



06-10-19

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SET 2 2019 BEST

Q1: Write a PL-SQL script to compare three given numbers and display them in ascending order.

Q2: For the following relation schema:

employee(employee-name, street, city)
works(employee-name, company-name, salary)
company(company-name, city)
manages(employee-name, manager-name)

Find the names of all employees in the database who live in the same cities as the companies for which they work.

**DEPARTMENT OF COMPUTER SCIENCE
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Assignment - I (CSCC23: Data and File Structures)

Instruction: Submit hand written assignment on or before 22nd February 2019.

- A 1. Suppose that there is an empty object 'a' of Array data structure and we want to insert numbers of below series one by one from left to right. Write an algorithm to insert these numbers into 'a' one by one using its insert(x, index) function that takes minimum number of movement operations and also derive the formula to get total number of movements.

1, 2, 2, 3, 3, 3, 4, 4, 4, ..., n, n, n, n, ...n times.

- A 2. Suppose that there is an empty object 'a' of Array data structure and we want to insert numbers of below series one by one from left to right. Write an algorithm to insert these numbers into 'a' one by one using its insert(x, index) function that takes maximum number of movement operations and also derive the formula to get total number of movements.

1, 2, 2, 3, 3, 3, 4, 4, 4, ..., n, n, n, n, ...n times.

- A 3. Suppose that there is an empty object 'a' of Array data structure and we want to insert numbers of below series one by one from left to right. Write an algorithm to insert these numbers into 'a' one by one using its insert(x, index) function that takes minimum number of movement operations and also derive the formula to get total number of movements.

1, 2, 2, 2, 3, 3, 3, 3, 3, 3, ..., n, n, n, n, ...n² times.

- A 4. Suppose that there is an empty object 'a' of Array data structure and we want to insert numbers of below series one by one from left to right. Write an algorithm to insert these numbers into 'a' one by one using its insert(x, index) function that takes maximum number of movement operations and also derive the formula to get total number of movements.

1, 2, 2, 2, 3, 3, 3, 3, 3, 3, ..., n, n, n, n, ...n² times.

- A 5. Let A and B are lower and upper triangular matrices respectively of order n x n. Write efficient algorithm to get the product of A and B i.e. A x B and also derive to formula to get minimum number of multiplication operations.

- A 6. Let A and B are upper and lower triangular matrices respectively of order n x n. Write efficient algorithm to get the product of A and B i.e. A x B and also derive to formula to get minimum number of multiplication operations.

- A 7. Let A and B are diagonal and lower triangular matrices respectively of order n x n. Write efficient algorithm to get the product of A and B i.e. A x B and also derive to formula to get minimum number of multiplication operations.

- A 8. Let A and B are lower triangular and diagonal matrices respectively of order n x n. Write efficient algorithm to get the product of A and B i.e. A x B and also derive to formula to get minimum number of multiplication operations.