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SAVITRI AMMAL ENGINEERING COLLEGE

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1983 Society Regd. Act 1986

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School of Computing

First CIA Examination – Sep 2023

Course Code: CSE211

Course Name: Formal Language and Automata Theory

Duration: 90 minutes

Max Marks: 50

PART A

Answer all the questions

10*2=20 marks

1. Describe about grammar in automata theory.
2. Show the category of languages in Chomsky's hierarchy.
3. Differentiate NFA and DFA.
4. Find a regular expression for $L = \{w \in \{0,1\}^* : 'w' \text{ has at least one pair of consecutive zeros}\}$.
5. Define homomorphism in closure property of regular language.
6. Draw the parse tree for the string "abbbb" with the productions $S \rightarrow aAB, A \rightarrow bBb, B \rightarrow A / \epsilon$
7. How can you tell if a grammar is ambiguous?
8. Write down the steps for converting NFA to DFA.
9. State kleene's theorem.
10. What is the minimization problem of DFA?

PART B

Answer all the questions

3*10=30 marks

11. Construct a Deterministic Finite Automata (DFA) for the language $L = \{w : n_a(w) \bmod 3 > n_b(w) \bmod 3\}$ where $\Sigma = \{a,b\}$.
12. Write the procedure for converting NFA to RE. Find the regular expression for the language $L = \{w \in \{a,b\}^* : n_a(w) \text{ is even and } n_b(w) \text{ is odd}\}$.
13. a) Show that $L = \{ww^R : w \in \{a,b\}^*\}$ is not regular. (5 marks)
b) Construct a Context Free Grammar for language $L = \{a^n b^m : \text{where } n \neq m\}$. (5 marks)



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SCHOOL OF ADVANCED STUDIES IN TECHNOLOGY

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School of Computing
First CIA Test – Sep 2023

Course Code: CSE 212

Course Name: COMPUTER ORGANIZATION &
ARCHITECTURE

Duration: 90 minutes

Max Marks: 50

PART A

10 x 2 = 20 Marks

Answer all the Questions

1. Solve the Boolean expressions to a minimum number of literals
 - a) $A'B + ABC' + ABC$
 - b) $(BC' + A'D)(AB' + CD')$
2. What is the Grey code for the decimal numbers 36 and 52?
3. List the truth table for the function, $F = xy'z + x'y'z + xyz$
4. Represent the unsigned decimal numbers 576 and 892 in BCD.
5. Solve the Boolean functions, using K-map $F(x, y, z) = \sum(3, 5, 6, 7)$
6. Write Demorgan's law.
7. Explain the truth table of EX-OR and EX-NOR gates.
8. Convert the following numbers with the indicated bases to decimal.
 - a) $(11010)_2$
 - b) $(24)_{16}$
 - c) $(36)_8$
9. Define binary number representation.
10. Find the 10's complement of 123900.

PART B

Answer all the Questions

3 x 10 = 30 Marks

11. Simplify the following Boolean function in product-of-sums form by means of a four-variable map. Draw the logic diagram with (a) OR-AND gates (b) NOR gates.
$$F(A, B, C, D) = \sum(2, 3, 4, 5, 6, 7, 11, 14, 15)$$
12. Design a sequential circuit with two JK flip-flops A and B and two inputs E and X. if $E=0$, the circuit remains in the same state regardless of the value of X. When $E=1$ and $X=1$, the circuit goes through the state transitions from 00 to 01 to 10 to 11 back to 00, and repeat. When $E=1$ and $x=0$, the circuit goes through the state transitions from 00 to 11 to 10 to 01 back to 00, and repeat.
13. Derive and explain an algorithm for fixed point unsigned binary multiplication with an example.



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School of Computing
First CIA Exam –Sept 2023
Course Code: CSE214
Course Name: Computational Statistics
Duration: 90 minutes Max Marks: 50

PART A

Answer all the questions

35 marks

1. Find out the regression coefficient of advertisement and predict sales & profit value for the given data and find the error based on prediction.

$$\text{Sales}^T = [5, 6, 7, 8, 9]; \text{Profit}^T = [3, 4, 5, 6, 7];$$

$$\text{Advertise}^T = [0.5, 0.6, 0.7, 0.8, 0.9] \quad (17)$$

2. Derive the estimation of model parameter of multiple linear regression model. (10)

3. Sales (in lakhs) of two products P1 and P2 for many branches where the amount follow a bivariate normal distribution with parameters:

- $\mu_x = 80$ and $\mu_y = 90$. Are the marginal means
- $\sigma_x = 20$ and $\sigma_y = 25$ are the marginal standard deviation
- $\rho = 0.70$ Is the correlation co-efficient

Suppose we select branch at random, what is the probability that

- c) A branch sales over 95 for P2?
d) The sum of P1 and P2 over 180?

$$\varphi(-0.24) = 0.59; \varphi(-0.2) = 0.58; \varphi(-1) = 0.16; \varphi(1) = 0.84; \quad (8)$$

PART B

Answer all the questions

15 marks

4. Derive the equation of independent multivariate normal distribution (15)



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School of Computing
First CIA Examination – Sep 2023
Course Code: INT104
Course Name: DATABASE
MANAGEMENT SYSTEMS
Duration: 90 minutes Max Marks: 50

PART A

Answer all the questions

10 * 2 = 20 Marks

1. Identify any two types of DBMS Users and explain their roles.
2. Discuss any two unary operators in relational algebra.
3. Differentiate left and right outer join operations
4. Discuss the difference between union and union all in SQL
5. Write SQL Query to print all the records from student table who lives in city Thanjavur and also age less than 20
6. What is the syntax to alter a table using SQL
7. Name any 4 constraints in DBMS and its need.
8. Differentiate primary and secondary index.
9. Differentiate physical vs conceptual data independence.
10. What is a cartesian product in relational algebra. Explain with small example

PART B

Answer all the questions

3 * 10 = 30 Marks

11. Discuss in detail any three data models
12. Discuss in detail 3-Schema Architecture
13. Design ER Model for a Company Database.

The company is organized into DEPARTMENTS. Each department has a name, number and an employee who manages the department. A department may have several locations

Each department controls a number of PROJECTS. Each project has a unique name, unique number and is located at a single location. We store each EMPLOYEE's social security number, address, salary, sex and birthdate. Each employee works for one department but may work on several projects. We keep track of the number of hours per week that an employee currently works on each project. We also keep track of the direct supervisor of each employee.



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U.S.S. - 1984 UGC Act 1956

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School of Computing

First CIA Examination - Sep 2023

Course Code: CSE213

Course Name: Object Oriented Programming

Duration: 90 minutes Max Marks: 50

PART A (2 × 10 = 20)

Answer all the questions

1. Distinguish between structures and classes.

2. Fill in the blank with Trigraph Sequences

```
___ define MSG "Hello"
```

```
___ define Program "CSBS"
```

```
int main()
```

```
___  
    cout<< "My message to " << MSG << endl;  
    cout<< "My program is " << Program;  
    return 0;
```

3. List the various methods of passing arguments to a function with example.

4. Define constructor and list its type.

5. Write the building blocks of Exception handling routine.

6. What is dangling pointer and memory leak?

7. Write short note on Enumeration data type with example.

8. Write the suitable technique to reduce function call overhead and justify it.

9. State the difference between #pragma startup and #pragma exit directives in terms of program execution.

10. Predict the output for the code

```
#include <iostream>  
#include <iomanip>  
using namespace std;  
int main()  
{  
    cout<<setfill('$') <<setw(5);  
    cout<< "10" <<endl;  
}
```

PART B (3x10=30)

Answer All the Three Questions

11. Consider a class named Calculator that contains overloaded functions for calculating areas of different geometric shapes. Implement the class with appropriate member functions to calculate the area of a rectangle, a circle, and a triangle.

Hint: The class should have public member functions named calculateArea for each of the following shapes:

Rectangle: calculateArea(double length, double width)

Circle: calculateArea(double radius)

Triangle: calculateArea(double base, double height)

12. Define a symbolic constant called STATE, set to initial value TAMILNADU. In the main() function, check if STATE is defined;

if yes, then

check if its value is TAMILNADU;

If YES, then

define another symbolic constant as CAPITAL with its value set as Chennai.

Else

Print the message "Name wrongly set"

Else

Define a symbolic constant called STATE and set its value as GUJARAT.

Implement the above using appropriate pre-processor directives and include test cases to verify all possible outputs.

13. Create a class called employee that contains a name (an object of class string) and an employee number (type long). Include a member function called getdata() to get data from the user for insertion into the object, and another function called putdata() to display the data. Assume the name has no embedded blanks. Write a main() program to exercise this class. It should create an array of type employee, and then invite the user to input data for up to 100 employees. Finally, it should print out the data for all the employees.