



SASTRA

ENGINEERING MANAGEMENT LAW SERVICES HUMANITIES EDUCATION

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School of Computing
Second CIA Test – Oct 2023

Course Code: CSE212

Course Name: COMPUTER ORGANIZATION &
ARCHITECTURE

Duration: 90 minutes

Max Marks: 50

PART A

10 x 2 = 20 Marks

Answer all the Questions

1. What is meant by Microprogrammed control?
2. Find the effective address, if the addressing mode of the instruction is base with index and displacement mode. [Base register = 4000, Index register = 60 with scale factor of 4 and displacement is 400].
3. List the difference between Von Neumann and Harvard architecture.
4. Draw the state transition diagram of instruction cycle.
5. Define Instruction register.
6. Define straight line sequencing.
7. Define the basic principle of pipelining.
8. Represent these data1: **56A01FE2** and data2: **3678D5F6** in little-endian and in the big-endian format.
9. Define interrupts and exceptions.
10. Define status register of IA-32 bit processor.

PART B

Answer all the Questions

3 x 10 = 30 Marks

11. Explain in detail about the RISC architecture and its addressing modes.
12. Explain in detail about the Intel Architecture-32 bit processor registers and its instruction set.
13. Explain in detail about timing and control unit with the flow chart for different type of instructions.



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School of Computing

Second CIA Examination - OCT 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. Define Linear Bounded Automata.
2. Write down the format of context sensitive grammar.
3. Eliminate useless productions from the given grammar
 $S \rightarrow aSb / \lambda / A$ $A \rightarrow aA$
4. Transform the given grammar into GNF.
 $S \rightarrow AB$, $A \rightarrow aA / bB / b$, $B \rightarrow b$
5. Write PDA for the given CFG.
 $S \rightarrow aA$, $A \rightarrow aABC / bB / a$, $B \rightarrow b$, $C \rightarrow c$
6. Discuss the closure properties of context free languages.
7. Draw the architecture of Turing Machine.
8. Differentiate NPDA and DPDA.
9. Design a TM which performs 1's complement.
10. Write the rules to convert PDA to CFG.

PART B

Answer any 3 questions

3*10=30 marks

11. Construct a NPDA to accept the language $L = \{a^n b^n c^m d^m, \text{ where } m, n \geq 1\}$.
12. Design a TM to accept the language $L = \{WW^R : W \in (a,b)^+\}$.
13. Eliminate λ or unit productions in the given grammar and then convert the resultant grammar into Chomsky normal form.
 $S \rightarrow AB / aB$, $A \rightarrow aab / \lambda$, $B \rightarrow bbA$
14. Prove that the language $L = \{a^n b^n c^n : n \geq 0\}$ is not context free.



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TECHNOLOGICAL EDUCATION



School of Computing

Second CIA Examination - Oct 2023

Course Code: CSE213

Course Name: Object Oriented Programming

Duration: 90 minutes Max Marks: 50

PART A (2x10=20)

Answer all the questions

1. Define class and object with suitable example.
2. What is meant by encapsulation?
3. What is the significance of inheritance in object-oriented programming and list its various types?
4. In what scenarios should a class include a virtual function?
5. Write short note on Access Specifiers.
6. What is meant by Dynamic Memory Allocation?
7. Predict the output

```
class MyClass {
public:
    static int staticVar;
    const int constVar;
    MyClass(int value) : constVar(value) {}
    void displayValues() {
        staticVar++;
        cout<<"static var="<<staticVar<<" constant
        var="<<constVar<<endl;
    };
};
int MyClass::staticVar = 0;
int main() {
    MyClass obj1(10);
    MyClass obj2(20);
    obj1.displayValues();
    obj2.displayValues();
    return 0; }
```

8. What is an abstract class?
9. Compare and contrast static binding and late binding.



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U.S.A. & the UGC Act, 1956

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School of Computing

Second CIA Examination – Oct 2023

Course Code: INT104

Course Name: DATABASE
MANAGEMENT SYSTEMS

Duration: 90 minutes Max Marks: 50

PART A

Answer all the questions

5 * 2 = 10 Marks

1. Differentiate clustered index and secondary index
2. Draw the node structure of B+ tree.
3. Write an SQL query to find the top three salary from the employee table.
4. Compare full functional dependency and partial functional dependency
5. Compare transaction and process.

PART B

Answer all the questions

3 * 10 = 30 Marks

6. Discuss the general guidelines for a good database design with examples.
7. Discuss the following with examples
 - a. 3nf
 - b. 3.5nf
8. With a neat diagram explain any two types of hashing techniques with example.

PART C

Answer all the questions

1 * 10 = 10 Marks

9. Explain the problems that may occur with concurrent transactions



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School of Computing
Second CIA Exam – Oct 2023

Course Code: CSE214

Course Name: Computational Statistics

Duration: 90 minutes Max Marks: 50

PART A

Answer ANY TWO questions

30 marks

1. Calculate Fisher discriminant score for the data $X_0^T = [-2, -3]$ and allocate it to the appropriate groups. $n_2=n_3=3$. $p_1=p_2=0.2, p_3=0.6$.

$$\begin{aligned} \pi_1: X_1 &= \begin{bmatrix} -1 & 5 \\ 1 & 3 \\ 0 & 1 \end{bmatrix}; \bar{X}_1 = \begin{bmatrix} 0 \\ 3 \end{bmatrix}; \pi_2: X_2 = \begin{bmatrix} 1 & -2 \\ 0 & 0 \\ -1 & -4 \end{bmatrix}; \bar{X}_2 = \begin{bmatrix} 0 \\ -2 \end{bmatrix} \\ \pi_3: X_3 &= \begin{bmatrix} -2 & 0 \\ -2 & 1 \\ -2 & 5 \end{bmatrix}; \bar{X}_3 = \begin{bmatrix} -2 \\ 2 \end{bmatrix} S_{pooled}^{-1} = \begin{bmatrix} 1.03 & 0.09 \\ 0.09 & 0.26 \end{bmatrix} \quad (15) \end{aligned}$$

2. Derive the steps of calculating Principal Components. (15)

3. From the factor model derive the variance explained by the factors (15)

PART B

Answer the question

20 marks

4. a) Considers the following eigenvalues (5, 10, 10) and

$$\text{eigen vectors} \begin{bmatrix} 1.25 & -2 & -1 \\ -0.5 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}.$$

Apply Spectral Decomposition theorem and consider the number of Components to be selected is 2. (10)

- b) Apply Fisher discriminant distance calculation and allocate $X_0^T = [8.5, 318]$ to the either of group π_1 or π_2 . Mean of points in π_1, π_2 and π_3 are $\bar{X}_1 = \begin{bmatrix} 7.2 \\ 295 \end{bmatrix}; \bar{X}_2 = \begin{bmatrix} 8.2 \\ 312 \end{bmatrix}; \bar{X}_3 = \begin{bmatrix} 8.8 \\ 323 \end{bmatrix}$

$$S_{pooled}^{-1} = \begin{bmatrix} 1.07 & -0.09 \\ -0.09 & 0.27 \end{bmatrix}$$

(6)

- c) Distinguish exploratory and confirmatory factor model (4)