SASTRA DEEMED UNIVERSITY

(A University under section 3 of the UGC Act, 1956)

End Semester Examinations **December 2022**

Course Code: **CSE212**

Course: **COMPUTER ORGANIZATION & ARCHITECTURE**

QP No. :**U108R** Duration: **3** hours

Max. Marks:**100**

PART - A

Answer all the questions **10 x 2 = 20 Marks**

1. Represent the unsigned decimal numbers 256 and 512 in BCD.
2. Solve the Boolean function using K–map F (x, y, z) = $\Sigma(1, 2, 3, 6, 7)$.
3. Define latency and throughput.
4. Find the effective address, if the addressing mode of the instruction is base with index and displacement mode. [Base register = 3000, Index register = 120 with scale factor of 2 and displacement is 200].
5. What is meant by microprogrammed control?
6. Define the basic principle of pipelining.
7. Define Interrupt Service Routine.
8. Explain cache memories.
9. Explain the process of arbitration.
10. Draw the instruction cycle state transition diagram.

PART – B

Answer any Four questions **4 x 15 = 60 Marks**

11. a) Explain in detail about JK- flip flop and T- flip flop. (8)
    b) Derive and explain an algorithm for adding and subtracting two fixed point signed magnitude binary numbers. (7)

12. a) Explain in detail about the IA-32 registers and instruction set. (10)
    b) Compare RISC and CISC. (5)

13. a) Discuss in detail about memory reference instructions with flow chart. (10)
    b) Design the accumulator logic with logic diagram. (5)

14. a) Discuss in detail about the serial interface interrupt circuit. (8)
    b) Determine the functions of program controlled I/O. (7)

15. a) Justify the use of DMA controllers in a computer system. (10)
    b) Discuss about vector processing. (5)

16. a) Justify the operation of superscalar processor. (8)
    b) Discuss the addressing modes of RISC architecture. (7)

PART - C

Answer the following **1 x 20 = 20 Marks**

17. a) Design a 2-bit count-down counter. This is a sequential circuit with two flip flops and one input x. When x =0, the state of the flip-flops does not change. When x= 1, the state sequence is 11, 10, 01, 00, 11, and repeat. (10)
    b) Explain in detail about timing and control unit with the flow chart for different type of instructions. (10)

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End Semester Examinations **December 2022**

Course Code: **CSE213**

Course: **OBJECT ORIENTED PROGRAMMING**

QP No. :**U344R**

Duration: **3 hours**

Max. Marks:**100**

PART – A

Answer all the questions **10 x 2 = 20 Marks**

1. Why we need object oriented programming language.
2. Give an example for Trigraph and Digraph sequence.
3. Predict the output/Error of the following code:

```
#include <stdio.h>
#define  i 10
int main()
{
#define i 20
printf("%d",i);
 return 0;
}
```

4. Recall the syntax of two dimensional array initialization with an example.
5. How data hiding is achieved in c++?
6. Why is virtual base class needed in inheritance.

7. Define a function template that takes two generic arguments and swap them.

8. How memory management is performed dynamically in C++?

9. Define friend function and explain its characteristics.

10. Difference between aggregation and composition in UML.

PART – B

Answer all the questions **4 x 15 = 60 Marks**

11. Explain the paradigms of OOP.

(OR)

12. The runs scored by 10 players in 5 matches are stored in 2D array of size 10x5. You need to find out the runs scored by the topmost scorer as well as lowest scorer, by total runs. Accessing array elements should be done with pointers only. Write a C++ program to accomplish the above task.

13. Define a class named Library with the following members.
BookTitle(string), Author. Declare an array of type Library to store the details of books in thelibrary. Define member functions to performi. searchBook() – thatreturns the stock of the book that mvalues.ii. byAuthor() – thatnames of the books by that author.
Write a C++ code to perform the above task.

(OR)

14. Briefly explain the concept of exception handling in C++ with the help of built-in constructs.

15. Create a class called DISTANCE with data member feet and inches. Use appropriate constructor. Include function to get and display

details of DISTANCE class. Overload + operator to add two DISTANCE objects and return the resultant object to main().And overloading function should be defined outside the class with help of scope resolution operator.

(OR)

16. With diagram, explain the different types of inheritance. Give an example for hierarchical and multiple inheritance.

17. Write a program that write and read the students details in a file.

(OR)

18. Develop a class diagram for Attendance Management System Include Course, Teacher, Students, Admins classes with attributes and operation. Consider proper association between classes.

PART- C

Answer the following **1 x 20 = 20 Marks**

19. a) A simple Calculator performing the four basic arithmetic operations in C++ using a class template. The template of the class will consist of two variables whose values are passed at the time of object creation. The constructor of this class takes two arguments of generic datatypes. Calculator class template consists of five main functions – show(), addition(), subtraction(), multiplication(), and division(). The show() function is responsible for calling the rest of the four generic functions. Create two instances from the template of Calculator class and performed the basic calculations using its class functions. (10)

b) Write a program to create classes "Dollar" and "Rupee". Write conversion routine to convert dollar to rupee (1 dollar = 108 rupees). (10)

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End Semester Examinations

December 2022

Course Code: **CSE214**

Course: **COMPUTATIONAL STATISTICS**

QP No. :**U104R** Duration: **3** hours

Max. Marks:**100**

PART -A

Answer any FOUR questions **4 x 20 = 80 Marks**

1. Amazon is planning for analyzing their sales data X and constructed factors. Justify that the selected factors are explaining the required variance.

$$\text{Loadings} = \begin{bmatrix} 0.56 & 0.82 \\ 0.78 & -0.53 \\ 0.65 & 0.75 \\ 0.94 & -0.1 \\ 0.80 & -0.54 \end{bmatrix}$$

$$\text{cov}(X) = \begin{bmatrix} 1 & 0.2 & 0.96 & 0.42 & 0.01 \\ & 1 & 0.13 & 0.71 & 0.85 \\ & & 1 & 0.50 & 0.11 \\ & & & 1 & 0.79 \\ & & & & 1 \end{bmatrix}$$

2. Fit a multivariate straight-line model using the given data and prove $Y^TY = \hat{Y}^T\hat{Y} + \hat{\varepsilon}^T\hat{\varepsilon}$

Z^T=(2, 3, 4, 5, 6); $Y_1^T = (2, 6, 8, 9, 12)$; $Y_2^T = (-2, -2, 4, 6, 4)$

3. Calculate Fisher discriminant score for the data $X_0^T = [-3, -2]$ and allocate it to the appropriate groups. n1=n2=n3=3. p1=p2=0.2,p3=0.6.

Low: $X_1 = \begin{bmatrix} -3 & 4 \\ -1 & 2 \\ -2 & 0 \end{bmatrix}; \overline{X_1} = \begin{bmatrix} -2 \\ 2 \end{bmatrix}; S_1 = \begin{bmatrix} 1 & -1 \\ -1 & 4 \end{bmatrix}$

Med: $X_2 = \begin{bmatrix} -1 & 5 \\ 1 & 3 \\ 0 & 1 \end{bmatrix}; \overline{X_2} = \begin{bmatrix} 0 \\ 3 \end{bmatrix}; S_2 = \begin{bmatrix} 1 & -1 \\ -1 & 4 \end{bmatrix}$

High: $X_3 = \begin{bmatrix} 1 & -2 \\ 0 & 0 \\ -1 & -4 \end{bmatrix}; \overline{X_3} = \begin{bmatrix} 0 \\ -2 \end{bmatrix}; S_3 = \begin{bmatrix} 1 & 1 \\ 1 & 4 \end{bmatrix}$

4. (a) Consider the hypothetical distance between pairs of five objects as follows. Construct dendrogram using single linkage clustering. (15)

$$D = \begin{bmatrix} 0 & & & & \\ 10 & 0 & & & \\ 4 & 8 & 0 & & \\ 7 & 6 & 10 & 0 & \\ 12 & 11 & 3 & 9 & 0 \end{bmatrix}$$

(b) Distinguish Agglomerative and DIANA clustering. (5)

5. (a) Consider you and your friend are processing d features of customer data. Processing d features becomes difficult for you and now you need to reduce the features. Discuss PCA algorithm steps to reduce the features. (15)

(b) Distinguish exploratory factor analysis and confirmatory factor analysis. (5)

6. (a) In the process of separation of population, apply the maximum ratio formula and find the college in which the student can be admitted with his given CGPA and GRE scores $X_0^T = [8.5, 318]$.

$\overline{X_1} = \begin{bmatrix} 7.2 \\ 295 \end{bmatrix}; \overline{X_2} = \begin{bmatrix} 8.2 \\ 312 \end{bmatrix}; \overline{X_3} = \begin{bmatrix} 8.8 \\ 323 \end{bmatrix}; S_{Pooled} = \begin{bmatrix} 0.96 & 0.32 \\ 0.32 & 3.87 \end{bmatrix}$ (10)

(b) Derive the covariance of regression coefficient of linear regression model. (10)

PART- B

Answer the following **1 x 20 = 20 Marks**

7. (a) Two dimensional data X=(3,2,4,3,5), Y=(1,4,6,3,7) are given. Apply kmeans clustering to divide the items into two groups. (15)
   (b) Interpret the following confusion matrix by calculating APER and accuracy percentage. (5)

Confusion matrix		Predicted	
Actual		No	Yes
	No	413	37
	Yes	82	318

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SASTRA DEEMED UNIVERSITY

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End Semester Examinations

December 2022

Course Code: **CSE211**

Course: **FORMAL LANGUAGE & AUTOMATA THEORY**

QP No. :**U202R**

Duration: **3** hours

Max. Marks:**100**

PART - A

Answer all the questions **10 x 2 = 20 Marks**

1. Compare the transition function 'δ' in deterministic and Non-deterministic finite automata.

2. Identify L^0, L^1, L^2, L^3. For the language L={ab, bc}

3. Construct an automaton that accepts the valid identifier.

4. Construct a Context-Free Grammar for a language $L = \{wcw^R \mid$ where $w \in (a, b)^*\}$.

5. Identify the language generated by the following grammar
   G={ $S \rightarrow aSbb$ and $S \rightarrow abb$}

6. Eliminate the productions from the following grammar
   $S \rightarrow XYX$
   $X \rightarrow 0X \mid \varepsilon$
   $Y \rightarrow 1Y \mid \varepsilon$

7. Differentiate Context Sensitive Grammar and Unrestricted Grammar.

8. What is a multi-tape Turing machine?

9. There are two set of strings A= {00, 001, 1000} and b= {0, 11, 011}. Can we construct the Post Correspondence solution for the above sets? Justify your answer.

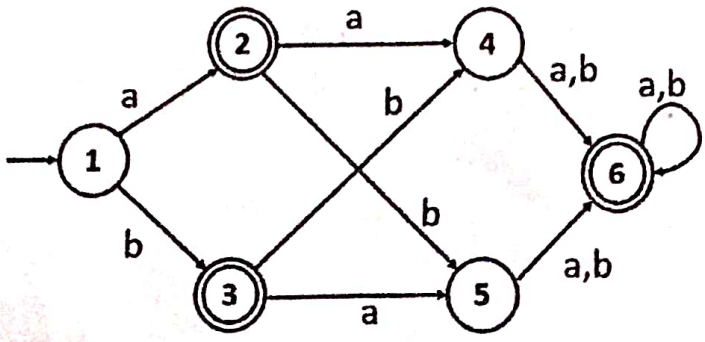
10. Consider the following grammar rules {"|0" → "0||", "1" → "0|", "0" → "ε"}. Derive the string "101" by applying the Markov algorithm.

PART - B

Answer any FOUR questions **4 x 15 = 60 Marks**

11. Construct the NFAs for the basic regular expressions ε, ϕ and the input symbol a. With the necessary steps and descriptions convert the Regular expression 10 + (0 + 11)0* 1 into its equivalent e-NFA.

12. What is the basis and induction steps in Myhill Nerode Theorem? Using Myhill Nerode theorem identify the distinguishable pairs of nodes from the following DFA. Also, construct its equivalent minimized DFA.



13. List out the conditions in Pumping Lemma for Context-Free language. Can you prove that the given language is a Context-Free language using Pumping Lemma? Prove by contradiction the

language L = $\{0^m1^n2^n3^m \mid n, m >= 1\}$ is not a Context-Free language by the pumping lemma.

14. Compare Chomsky Normal Form (CNF) and Greibach Normal Form (GNF). With the necessary steps convert the grammar into Greibach Normal Form (GNF).

$S \rightarrow AY \mid XX$

$X \rightarrow x \mid SX$

$Y \rightarrow y$

$A \rightarrow x$

15. With neat diagrams explain any five variants of the Turing Machine.

16. What is an Undecidable problem? Prove that the membership problem is an Undecidable problem.

PART - C

Answer the following **1 x 20 = 20 Marks**

17. a). Depict the pictorial representation of Finite Automata, Push Down Automata, and Turing Machine. (10)

b). Consider the language L= $\{WW^R : w \in (0, 1)\}$. Construct a Turing Machine (TM) that accepts the language. (10)

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SASTRA DEEMED UNIVERSITY

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End Semester Examinations

December 2022

Course Code: **INT104**

Course: **DATABASE MANAGEMENT SYSTEMS**

QP No. :**U127R**

Duration: **3** hours

Max. Marks:**100**

PART-A

Answer any FOUR questions **4 x 20 = 80 Marks**

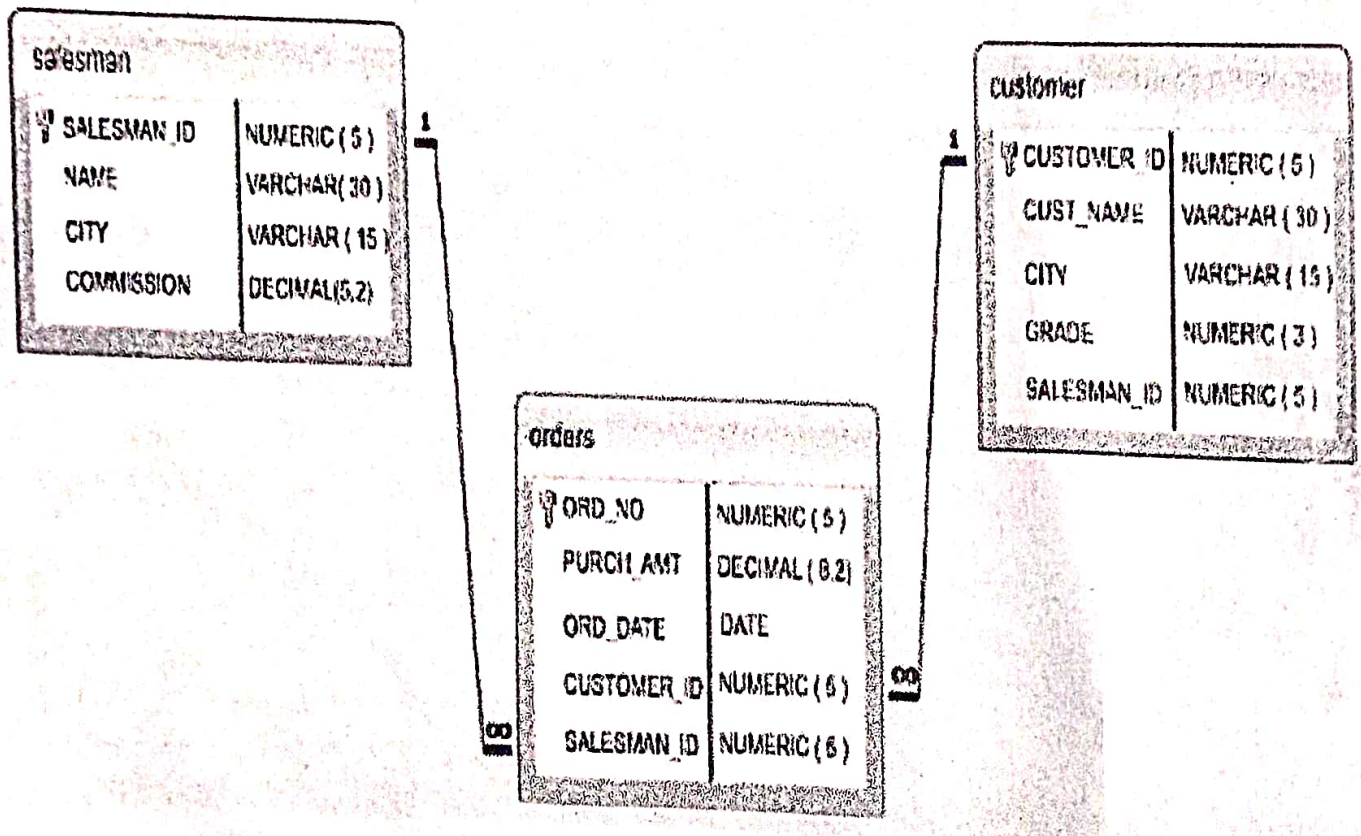
1. (a) Compare and Contrast between database Systems and file systems. Justify with suitable examples. (10)
   (b) With the help of a neat block diagram explain the basic architecture of a database management system. (10)

2. (a) Interpret the two different types of ordered indices and show how they are differing to access a particular value using index entry to access records in a file. (10)
   (b) Construct an E-R diagram and reduce it to relational database model for a university database for scheduling of classrooms for final exams. This database could be modelled using entities as exam (Course_name, section_number, room_number, time); course (name, department, C_number), room (r_number, capacity, building). Entity section is dependent on course. State any assumptions you make. (10)

3. (a) Explain the role of functional dependencies in normalization and its types with suitable examples. (10)
   (b) Let us assume a table User_Personal as given below: Make the normalization to 3NF. Show the steps. (10)

UserID	U_email	Fname	Lname	City	State	Zip
MA12	Mani@ymail.com	MANISH	JAIN	BILASPUR	CHATISGARH	458991
PO45	Pooja.g@gmail.com	POOJA	MAGG	KACCH	GUJRAT	832212
LA33	Lavle98@jj.com	LATHA	DUTT	RAIPUR	CHATISGARH	853578
CH99	Cheki9j@ih.com	CHIMAL	BEDI	TRICHY	TAMIL NADU	632011
DA74	Danu58@g.com	DANY	JAMES	TRICHY	TAMIL NADU	645018

4. Consider the following schema:



Salesman:

salesman_id	Name	City	Commission
5001	James Hoog	New York	0.15
5002	Nail Knite	Paris	0.13
5005	Pit Alex	London	0.11
5006	Mc Lyon	Paris	0.14
5003	Lauson Hen	Paris	0.12
5007	Paul Adam	Rome	0.13

Customer:

Cust_id	Cust_name	City	Grade	Salesman_id
3002	Nick Rimando	New York	100	5001
3005	Graham Zusi	California	200	5002
3001	Brad Guzan	London	200	5005
3004	Fabian Johns	Paris	300	5006
3007	Brad Davis	New York	200	5001
3009	Geoff Camero	Berlin	100	5003
3008	Julian Green	London	300	5002
3003	Jozy Altidor	Moscow	200	5007

Orders:

Ord_no	Purch_amt	ord_date	customer_id	salesman_id
70001	150.5	2012-10-05	3005	5002
70009	270.65	2012-09-10	3001	5005
70002	65.26	2012-10-05	3002	5001
70004	110.5	2012-08-17	3009	5003
70007	948.5	2012-09-10	3005	5002
70012	250.45	2012-06-27	3008	5002
70011	75.29	2012-08-17	3003	5007
70013	3045.6	2012-04-25	3002	5001

Construct the SQL statements.

(a) Create a table with necessary constraints
   (i) Primary key and foreign key constraints.
   (ii) Grade is between 100 to 400.
   (iii) Commission is not more than 20%.

(b) Retrieve the value of salesman id of all salesmen, getting orders from the customers in orders table without any repeats.

(c) Find the number of salesmen currently listing for all of their customers

(d) Select the highest grade for each of the cities of the customers.

(e) Find the highest purchase amount ordered by each customer on a particular date with their ID, order date and highest purchase amount.

(f) Finds out each order number followed by the name of the customers who made the order.

(g) Find the list of customers who appointed a salesman for their jobs who does not live in the same city where their customer lives, and gets a commission is above 12%.

(h) Find the salesmen of the city New York who achieved the commission more than 13%.
(i) Display distinct salesman and their cities.

5. (a) State the number of general equivalence rules on relational algebra expressions which are used to transform expressions into other logically equivalent expressions. (10)
(b) Why is concurrency control needed in DBMS? With the help of examples explain various problems that can occur due to concurrency? (10)

6. (a) Explain the method of enforcing discretionary access control (DAC) in a database system based on the granting and revoking of privileges. (10)
(b) Show the architecture of a typical data warehouse and illustrate the gathering of a data, the storage of a data and the querying and data analysis support. (10)

PART –B

Answer the following **1 x 20 = 20 Marks**

7. (a) Construct an E-R diagram for a hospital with a set of patients and a set of medical doctors. Associate with each patient a log of the various tests and examinations conducted. (5)
(b) Consider the two tables. (10)

Student_Info table: Student_id varchar2(20), Last_name varchar2(25), First_name varchar2(20), Dob varchar2(20), Address varchar2(300), City varchar2(20), State varchar2(2), ZipCode varchar2(9), Telephone varchar2(10), Fax varchar2(10), Email varchar2(100)
Department_Info table:
Department_Id varchar2(20), Department_Name varchar2(25)
Construct the SQL statements.

(i) Create a view named student from student_info and department_info tables that contains only the following columns student_id, first name, last name and department_id.
(ii) Create a synonym for student_info table with name students.

(iii) Create a sequence instseq with the following specifications minimum value 1, maximum value 20, increment by 1, start with 0, with cycle and cache 10.

(iv) Alter the sequence such that the maximum value is only 15.

(v) Create a index named stud on first name of student_info table.

(c) Consider three transactions: T1, T2 and T3. Draw the precedence graph for the following schedule consisting of these three transactions and determine whether it is serializable. If so, give its serial order(s). (5)

Time	T1	T2	T3
t1:			read(Y)
t2:			read(Z)
t3:	read(X)		
t4:	write(X)		
t5:			write(Y)
t6:			write(Z)
t7:		read(Z)	
t8:	read(Y)		
t9:	write(Y)		
t10:		read(Y)	
t11:		write(Y)	
t12:		read(X)	
t13:		write(X)	

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