

CBCS Scheme

End-Semester Examination Autumn 2022

MCA (Third Semester)

Subject Name: Compiler DesignSubject Code: CA403105CA

Time: Three Hours

Max Marks: 50

- Note: (1) All the Questions are compulsory.
 (2) Draw neat and clean diagram wherever required
 (3) Assume suitable data wherever required.

UNIT-1

1. What is a Compiler? List out the Errors encountered in each Phase of Compilation. [5 marks]

UNIT-2

2. Construct the LALR (1) Parse Table for the Grammar **G** and check whether the Grammar is in LALR (1) or not. [5 marks]
 Also show Shift Reduce Actions for the input string " $a + b * c + d$ ".
 The given Grammar **G** is

$$E \rightarrow E + T / T$$

$$T \rightarrow T * F / F$$

$$F \rightarrow i$$

UNIT-3

3. (a) Explain the following Storage Allocation Schemes with an Example: (Any Two): [5 marks]
 (i) Stack Storage Allocation.
 (ii) Static Storage Allocation.
 (iii) Heap Storage Allocation.
- (b) Differentiate between the different implementations of Three Address Code with an example. [5 marks]
- (c) List out **TWO** main advantages of using Parameter Passing Techniques in Source Code? Explain any **THREE** Parameter Passing mechanisms with an example. [5 marks]
- (d) Write Syntax Directed Definition for the Assignment Statements with Integer Type? [5 marks]

UNIT-4

4. (a) Explain the Code Generation Algorithm with an example. [5 marks]
- (b) What is a Peephole Optimization? Explain the following methods for Code Optimization: [5 marks]
 (i) Loop Unrolling
 (ii) Hoisting Loop Invariants
 (iii) Argument Culling
 (iv) Replace Slower Instructions

P.T.O

(c) Consider the following Three Address Code statements:

[10 marks]

```
(1) i = m - 1
(2) j = n
(3) t1 = 4 * n
(4) v = a[t1]
(5) i = i + 1
(6) t2 = 4 * i
(7) t3 = a[t2]
(8) if t3 < v goto (5)
(9) j = j - 1
(10) t4 = 4 * j
(11) t5 = a[t4]
(12) if t5 > v goto (9)
(13) if i >= j goto (23)
(14) t6 = 4 * i
(15) x = a[t6]
```

```
(16) t7 = 4 * i
(17) t8 = 4 * j
(18) t9 = a[t8]
(19) a[t7] = t9
(20) t10 = 4 * j
(21) a[t10] = x
(22) goto (5)
(23) t11 = 4 * i
(24) x = a[t11]
(25) t12 = 4 * i
(26) t13 = 4 * n
(27) t14 = a[t13]
(28) a[t12] = t14
(29) t15 = 4 * n
(30) a[t15] = x
```

and compute the following:

- (i) Construction of Flow Graph
- (ii) Optimize the above Flow Graph for Common Sub Expression Elimination and Copy Propagation.

Time: Three Hours

Note: (1) All the Questions are Compulsory.

(2) Draw Neat and Clean Diagram where ever required

(3) Assume Suitable Data where ever required.

UNIT-1**[5 marks]**

1. (a) Explain the working of OSI Model.

UNIT-2**[5 marks]**

2. (a) Write Short Notes on the following (ANY TWO)
- Hamming Code
 - Error Detection and Error Correction Codes
 - Flow Control and Error Control
 - Selective Repeat ARQ Protocol

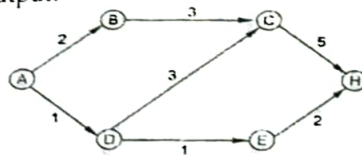
UNIT-3**[5 marks]**

3. (a) Discuss Circuit Switching and Packet Switching in Detail.

[5 marks]

- (b) Explain Various Classes of IP Addresses and Find Netid and Hostid for the following IP:
(i) 19.34.21.5 (ii) 201.2.4.2 (iii) 241.240.200.2

- (c) Find the Short Path between Node A and Node H for the following figure by applying Dijkstra Algorithm. Explain each step output. **[10 marks]**

**UNIT-4**

4. (a) Explain in brief about Plain Text, Cipher Text, Public Key and Private Key in Cryptography. **[5 marks]**
- (b) Explain the following Terms with reference to Network Security **[5 marks]**
(i) Secrecy (ii) Authentication (iii) Non repudiation (iv) Integrity Control
- (c) Write the process of RSA Algorithm for Encryption and Decryption of Data. For the given $p=3$, $q=11$, and $d=7$, write the process of Encryption and Decryption of the Plain Text "NIT" using RSA Algorithm **[10 marks]**

Time:

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UNIT-1

1. Write a function (in python) that takes a list of values as input parameter and returns another list without any duplicates. 5

UNIT-2

2. What are the major tasks in data preprocessing? How to handle missing data and noisy data? What do you understand by sampling? What are different types of sampling? 5

UNIT-3

3. (a) What is a linear regression model? Explain how would you train a linear regression model? What are the different cost functions used during such training? Discuss advantages and disadvantages of such cost function. 10
- (b) Define artificial neural network (ANN). How do ANNs work? What is the role of activation functions in ANN? Describe the use of back propagation algorithm in ANN? 5
- (c) What is a decision tree? Explain the algorithm for decision tree induction using an example. What is gini impurity? How it is different from entropy? 5

UNIT-4

4. (a) What do you understand by unsupervised learning? How it is different from supervised learning? Describe the steps of k-means algorithm. Explain it using an example. What are some stopping criteria for k-means clustering? What are the weaknesses of k-means algorithm? 10
- (b) Compare fuzzy-set and crisp-set. Explain fuzzy c-means algorithm. How it is different from k-means algorithm? 5
- (c) What do you understand by dimensionality reduction? Explain the steps of PCA using an example. 5

OR

Describe the steps of LDA. How it can be used as a classifier?

Time: Three Hours

Note:

UNIT-1

1. Discuss Ω -notation and show that $3x^2 - 3x - 5$ is $\Omega(x^2)$. [5 marks]

UNIT-2

2. Write one application of max-priority queue and one application of min-priority queue. Explain them. [5 marks]

UNIT-3

3. (a) Write a note on greedy approach and show with an example where a greedy approach does not work. [5 marks]

- (b) Find an optimal parenthesization of a matrix-chain product for a given four matrices of dimension 4×5 , 5×3 , 3×10 , 10×8 . Explain it. [5 marks]

- (c) Consider a undirected graph $G = (V, E)$ with nonnegative weights $w(i, j) \geq 0$ on its edges $(i, j) \in E$. Let s be a vertex in G . Assume you have computed the shortest paths from s , and minimum spanning tree of the graph. [10 marks]

Suppose we change the weights on every edge by adding 1 to each of them. The new weights are $w'(i, j) = w(i, j) + 1$ for every $(i, j) \in E$.

(a) Would the minimum spanning tree change due to the change in weights? Explain it.

(b) Would the shortest paths change due to the change in weights? Explain it.

UNIT-4

4. (a) Discuss the complexity classes NP-complete and NP-hard. [5 marks]

- (b) Write a short note on NP. Also show that the clique problem is NP. [5 marks]

- (c) What does COUNTING-SORT algorithm assume about input before applying? Write COUNTING-SORT algorithm. Illustrate the operation of COUNTING-SORT on the array $A = \{4, 8, 4, 2, 9, 9, 6, 2, 9\}$. [10 marks]

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UNIT-1

1. (a) What do you mean by Class and Object Diagrams? How do we represent private, public and protected in Class Diagrams? [5 marks]

UNIT-2

2. (a) Write a program to Explain break and continue Statement [5 marks]

UNIT-3

3. (a) Write a program which tells the use of try, catch and finally Block. [5 marks]
(b) Write a program showing two Threads acting upon a Single Object [5 marks]
(c) How Thread can be created in java? With the help of a Diagram Explain the Thread life Cycle in Detail [10 marks]

UNIT-4

4. (a) Draw and Explain Applet Life Cycle [5 marks]
(b) Explain Event Delegation Model and How it work? [5 marks]
(c) What is use of Server Socket Class and Socket Class of java.net package and Write a program to create Server that send data to the Client and create Client that received data from the Client [10 marks]