CBCS Scheme

Mid-Semester Examination Autumn 2022
MCA (First Semester)
Subject Name: Analysis and Design of Algorithms
Subject Code: CA403103CA

Time: Two Hours **Max Marks: 30**

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

UNIT-1

1. **(a)** Explain Big-oh (O) notation. **[2.5 marks]**

(b) Algorithms X and Y have a worst-case running time of $O(n)$ and $O(\log n)$, respectively. Therefore, algorithm Y always runs faster than algorithm X. **[2.5 marks]**

1. True
2. False

Explain your answer.

(c) For the functions, n^k and c^n, which of the following is/are correct about the asymptotic relationship between these functions? Assume that $k >= 1$ and $c > 1$ are constants. **[5 marks]**

(a) $n^k \in O(c^n)$
(b) $n^k \in \Omega(c^n)$
(c) $n^k \in \Theta(c^n)$

Explain the answer.

(d) Explain Master theorem with suitable examples. **[5 marks]**

UNIT-2

2. **(a)** In max-priority queue, using figures, illustrate the two consecutive procedures (Extract_Max(A) and Insert(A,10)) on the heap A ={ 15, 13, 9, 5, 12, 8, 7, 4, 0, 6, 2, 1 }. **[2.5 marks]**

(b) Using figures, illustrate the operation of BUILD-MAX-HEAP on the array A = {5, 3, 17, 10, 84, 19, 6, 22, 9}. **[2.5 marks]**

(c) Is it possible to convert a min-heap into a max heap in linear time? If yes, explain it with a suitable example. If not, then discuss the running time of this conversion? **[5 marks]**

(d) Using Figures, illustrate the operation of INSERTION-SORT on the array A {31, 41, 59, 26, 41, 58} that sort these numbers into decreasing order. Also explain its best-case and worst-case running time. **[5 marks]**

****

21223074

CBCS Scheme

Mid-Semester Examination Autumn 2022
MCA (Third Semester)
Subject Name: Object Oriented Concepts & Java
Subject Code: CA403101CA

Time: Two Hours

Max Marks: 30

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

UNIT-1

1. (a) What is an Object Model? [2.5marks]

(b) What is an Object-Oriented Analysis and Design? [2.5 marks]

(c) All Object-Oriented Programming Language provides mechanisms that help you to implement the Object-Oriented Model. They are? [5 marks]

(d) Write the difference between C++ and Java. [5 marks]

UNIT-2

2. (a) Draw and Explain JVM Architecture [2.5 marks]

(b) Write a Program to inherit the property of a Base class in Derived class using super statement [2.5 marks]

(c) Write the difference between Abstract class and Interface? [5 marks]

(d) Write a program to interchange the values inside an Object, since the same Object data is modified, we can see the data has been interchanged [5 marks]

******

21223074

CBCS Scheme

Mid-Semester Examination Autumn 2022
MCA (3rd Semester)
Subject Name: Data Science
Subject Code: CA403102CA

Time: Two Hours

Max Marks: 30

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

UNIT-1

1. (a) Write a python program *areaTrangle* that takes lengths of three sides: side1, side2, and side3 of the triangle as the input parameters and returns the area of the triangle as the output. Also, test that sum of the length of any two sides is greater than the third side. **[2.5 marks]**

(b) Write a program (in python) that prints Armstrong numbers in the range 1 to 1000. An Armstrong number is a number whose sum of the cubes of the digits is equal to the number itself. **[2.5 marks]**
For example, $370 = 3^3 + 7^3 + 0^3$

(c) Write a python program that takes a sentence as an input and replaces the first letter of every word with corresponding uppercase letter and rest of the letters in the word by corresponding letters in lowercase **without using any built-in string functions**. For example: **[5 marks]**
INPUT : **Name of my country is INDIA**.
OUTPUT: **Name Of My Country Is India**.

(d) What is the difference between shallow copy, deep copy and normal assignment operation? Explain with appropriate examples. **[5 marks]**

UNIT-2

2. (a) What is sampling bias? Explain with appropriate example. **[2.5 marks]**

(b) Why we need to clean the data? Discuss different methods used to clean the data. **[2.5 marks]**

(c) What do you understand by normalization of data? Discuss different methods used for data normalization? Explain how normalization is different from discretization of data. **[5 marks]**

(d) What are the different parameters used to evaluate the performance of a Model? Define each of them. Describe the steps to compute them. **[5 marks]**

******

2122307

CBCS Scheme

Mid-Semester Examination Autumn 2022
MCA (Third Semester)
Subject Name: Computer Network
Subject Code: CA403104CA

Time: Two Hours

Max Marks: 30

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

UNIT-1

1. (a) What do you mean by Broadcast and Point-to-point Networks [2.5marks]

(b) Explain the functions of Network Layer [2.5 marks]

(c) What do you mean by Network Topology and Explain its Types? [5 marks]

(d) Compare OSI Model With TCP/IP Model [5 marks]

UNIT-2

2. (a) Explain the concept of Framing with reference to Starting and Ending Flags with Bit Stuffing [2.5 marks]

(b) What are Various Data Transmission Modes in a Network? [2.5 marks]

(c) The message 1101011011 is to be transmitted using the CRC polynomial $X^4 + X+1$ to protect it from error. Find the message that should be transmitted. [5 marks]

(d) What do you understand by Piggybacking? Explain Sliding Window protocol having Window size 1, with 3 Bit Sequence Number. [5 marks]

******

2122074

CBCS Scheme

Mid-Semester Examination Autumn 2022
MCA (Third Semester)
Subject Name: Compiler Design
Subject Code: CA403105CA

Time: Two Hours

Max Marks: 30

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

UNIT-1

1. (a) Explain how use of backpatching allows reduction in the number of passes of a compiler? [2.5 marks]

(b) Why do we need to have lexical analyser generators? What are its advantages? [2.5 marks]

(c) What are the different phases in a compiler? Explain each one of them. [5 marks]

(d) Write short notes on (Any Two): [5 marks]
(i) Lexeme, Token and Pattern.
(ii) Single and Multi-pass Compilers.
(iii) Bootstrapping.

UNIT-2

2. (a) Compute the FIRST and FOLLOW sets for each non-terminal of the grammar given below: [2.5 marks]

$S \rightarrow ABa \mid bCA$
$A \rightarrow cBCD \mid \varepsilon$
$B \rightarrow CdA \mid ad$
$C \rightarrow eC \mid \varepsilon$
$D \rightarrow bSf \mid a$

(b) Distinguish between Top-Down Parsing and Bottom-Up Parsing? [2.5 marks]

(c) Consider the following grammar: [5 marks]

$S \rightarrow a=A$
$A \rightarrow A + B \mid B$
$B \rightarrow B * C \mid C$
$C \rightarrow C \wedge D \mid D$
$D \rightarrow a$

Construct the Predictive Parsing Table for the grammar and check whether the grammars are in LL(1) or not?

(d) Construct the LALR (1) Parse Table for the grammar and check whether the grammar is in LALR (1) or not. Also show Shift Reduces actions for the Input String "xxxxy". [5 marks]
The given Grammar G is

$P \rightarrow xQy \mid yR$
$Q \rightarrow Qx \mid \varepsilon$
$R \rightarrow Ry \mid \varepsilon$

******