MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)
II B.Tech I Semester Supplementary Examinations, January 2024
Data Structures using C++
(IT)

Roll No										

Time: 3 hours   **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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SECTION-I

1	**A**	Define an Algorithm. State and explain its properties.	**[7M]**
	B	Explain the Performance Analysis.	**[7M]**

OR

2	**A**	What is Binary Searching? Analyze Binary Search Algorithm with an example.	**[7M]**
	B	Define Merge Sorting? How conceptually merge sort works?	**[7M]**

SECTION-II

3	**A**	Convert the following Infix expression A + B* (C+D) / F + D*E into Postfix expression and explain each and every step.	**[7M]**
	B	Write a C++ program to implement the operations of Singly Linked List.	**[7M]**

OR

4	**A**	What is a Threaded Binary Tree? What is its use? Explain the representation of Threaded Binary Trees.	**[7M]**
	B	Analyze various Tree Traversals with suitable example.	**[7M]**

SECTION-III

5	**A**	Define Priority Queue. What are the real time applications of Priority Queues? Explain the implementation of Priority Queue with an example.	**[7M]**
	B	Write a C++ program to implement the Queue ADT using arrays.	**[7M]**

OR

6	**A**	Evaluate the Deletion of element from the heap using an example.	**[7M]**
	B	Evaluate the Multiway Merge using suitable example.	**[7M]**

SECTION-IV

7	**A**	List the Collision Resolution Techniques. Explain any one technique.	**[7M]**
	B	Define double hashing? Analyze the double hashing techniques.	**[7M]**

OR

8	**A**	List and explain the types of hash function.	**[7M]**
	B	Compare and contrast of Hashing and Skip Lists.	**[7M]**

SECTION-V

9	**A**	What is a Binary search Tree? What is its use? Explain the representation of Binary search Trees.	**[7M]**
	B	Explain the Depth First Search algorithm for a graph with an example.	**[7M]**

OR

10	**A**	Explain the Kruskal's algorithm for generating a minimum spanning tree.	**[7M]**
	B	List some significant real time applications of minimum spanning tree and explain any one application.	**[7M]**

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MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)
II B.Tech I Semester Supplementary Examinations, January 2024
Mathematical Foundation of Computer Science
(CSE)

Roll No										

Time: 3 hours   **Max. Marks: 70**

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SECTION-I

1   **A**   What is principle disjunctive normal form? Obtain the PDNF of   **[7M]**
$$P \rightarrow ((P \rightarrow Q) \wedge \neg(\neg Q \vee \neg P)).$$

    B   Show that (a) $(\neg P \wedge \neg Q \wedge R) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$ **[5M]**

         (b) $(P \rightarrow Q) \rightarrow Q) \Rightarrow P \vee Q$ without constructing truth table.   **[2M]**

OR

2   **A**   Show that $(\forall x)(P(x) \rightarrow Q(x)) \wedge (\forall x)(Q(x) \rightarrow R(x)) \Rightarrow (\forall x)(P(x) \rightarrow R(x))$.   **[7M]**

    B   Show that $S \vee R$ is a tautologically implied by $(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow S)$ **[7M]**

SECTION-II

3   **A**   Define an equivalence relation? If R be a relation in the set of integers Z defined by R = { (x , y) : x ϵ Z , y ϵ Z , (x - y) is divisible by 6 }, then prove that R is an equivalence relation ?   **[7M]**

    B   Let A be a given finite set and P(A) its power set . let $\subseteq$ be the inclusion relation on the elements of P(A) .Draw the Hasse diagram of (P(A) , $\subseteq$) for i) A = { a } ii)) A ={ a ,b} iii)) A = { a,b,c } iv)) A = { a,b,c,d }.   **[7M]**

OR

4   **A**   Show that the set of all positive rational numbers forms an abelian group under the composition defined by a*b = (ab) / 2.   **[7M]**

    B   On the set Q of all rational number operation * is defined by a∗b = a +b − ab ,Show that this operation Q forms a commutative monoid.   **[7M]**

SECTION-III

5   **A**   How many ways can we get a sum of 8 when two indistinguishable dice are rolled?   **[7M]**

    B   Out of 5 men and 2 women, a committee of 3 is to be formed. In how many ways can it be formed if at least one woman is to be included? b) Find the number of arrangements of the letters in the word ACCOUNTANT.   **[7M]**

OR

6   **A**   Find how many integers between 1 and 60 that are divisible by 2 nor by 3 and nor by 5.Also determine the number of integers divisible by 5 not by 2, not by 3.   **[5M]**

    B   The question paper of mathematics contains two questions divided into two groups of 5 questions each.
a.In how many ways can an examinee answer six questions taking atleast two questions from each group.
b) How many permutations can be formed out of the letters of word   **[9M]**

"SUNDAY"? How many of these (i) Begin with S? (ii) End with Y? (iii) Begin with S & end with Y? (iv) S &Y always together?

SECTION-IV

7 **A** Solve the recurrence relation using generating functions $a_n - a_{n-1} + a_{n-2} = 0$ for $n \geq 2$ and $a_0 = 3$, $a_1 = 10$. **[7M]**

  B Solve $a_n = a_{n-1} + f(n)$ for $n \geq 1$ by using substitution method. **[7M]**

OR

8 Solve $a_n - 5 a_{n-1} + 6 a_{n-2} = 1$. **[14M]**

SECTION-V

9 **A** Explain indegree and out degree of a graph. Also explain about the adjacency matrix representation of graphs. Illustrate with an example? **[7M]**

  B Define planar graph and Hamiltonian graph with examples. **[7M]**

OR

10 **A** Explain about complete graph & complete bipartite graph with example. **[7M]**

  B Explain Depth- First-Search, Breadth-First-Search Algorithm. **[7M]**

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MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
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II B.Tech I Semester Supplementary Examinations, January 2024
Probability and Statistics
(CSE & IT)

Roll No										

Time: 3 hours   **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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SECTION-I

1   **A**   Is the function defined as follows a density function $f(x) = \begin{cases} e^{-x}, x \geq 0 \\ 0, \ x < 0 \end{cases}$.

If so, determine the probability that the variate having this density fall in the interval $(1,2)$? Find the cumulative probability $F(2)$? **[7M]**

B   1000 students have written an examination the mean of the test is 35 and standard deviation is 5. Assuming the distribution to normal. Find
(i) How many students' marks lie between 25 and 40? **[7M]**
(ii) How many students get more than 40?

OR

2   **A**   The probability that a man hitting the target is $\frac{1}{3}$. If he fires 6 times, find the probability that he fires (i) At the most 5 times (ii) Exactly once and (iii) At least two times. **[7M]**

B   If 2% of light bulbs are defective. Find (i) At least one is defective (ii) Exactly 7 are defective (iii) $p(1 < x < 8)$ in sample of 100. **[7M]**

SECTION-II

3   **A**   Calculate the coefficient of correlation between X and Y from the following data:

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

[10M]

B   Find the most likely price in Mumbai corresponding to the price of Rs 70 at Kolkata from the following data:

	Kolkata(X)	Mumbai(Y)
Average price	65	67
Standard deviation	2.5	3.5
Coefficient of Correlation	0.8	

[4M]

OR

4   The ranks of same 16 students in Mathematics and Statistics are as follows. Two numbers within the brackets denote the ranks of the students in Mathematics and Statistics: **[14M]**

(1,1)   (2,10)   (3,3)   4,4)   (5,5)   (6,7)   (7,2)   (8,6)
(9,8)   (10,11) (11,15) (12,9)   (13,14) (14,12) (15,16) (16,13)

Calculate the rank correlation coefficient for proficiencies of this group in Mathematics and Statistics.

SECTION-III

5   A population consists of five numbers 2, 3, 6, 8 and 11. Consider all possible   **[14M]** samples of size two which can be drawn without replacement from this population. Find (a) The mean of the population (b) The standard deviation of the population (c) The mean of the sampling distribution of means and (d) The standard deviation of sampling distribution of means.

OR

6   **A**   The mean life time of a sample of 100 light tubes produced by a company is   **[7M]** found to be 1560hrs with population standard deviation of 90 hrs. Test the hypothesis for $\alpha = 0.05$ that the mean life time of the tubes produced by the company is 1580 hrs.

    B   Explain briefly the following: **[7M]**
      (i) Type I error (ii) Type II error and (iii) Critical region.

SECTION-IV

7   **A**   Two independent samples of 8 and 7 items respectively have the following   **[7M]** values.

Sample I	11	11	13	11	15	9	12	14
Sample II	9	11	10	13	9	8	10	-

      Is the difference between the means of sample significant?

    B   The number of automobile accidents per week in a certain community are as   **[7M]** follows:12, 8, 20, 2, 14, 10, 15, 6, 9, 4. Are these frequencies in agreement with the belief that accident conditions were the same during this 10-week period. (Given$\chi^2_{0.05} = 16.9$ for 9 d.f)

OR

8   **A**   The measurements of output of two units have given the following results.   **[7M]** If both samples have been obtained from the normal populations at 10% significant level, test whether the two population have the same variance.

Unit-A	14.1	10.1	14.7	13.7	14.0
Unit-B	14.0	14.5	13.7	12.7	14.1

    B   A random sample of 10 bags of pesticide are taken whose weights are 50, 49,   **[7M]** 52, 44, 45, 48, 46, 45, 49, 45 (in kgs). Test whether the average packing can be taken to be 50 kgs. ($t_{0.05} = 1.833$ at 9 d.f

SECTION-V

9   **A**   In a telephone exchange the arrival of calls follows Poisson distribution with   **[7M]** an average of 8 minutes between two consecutive calls. The length of a call is 4 minutes. Determine
           a) The probability that the call arriving at the booth will have to wait.
           b) The average queue length that forms from time to time.
           c) The probability that an arrival will have to wait for more than 10 minutes before the phone is free.

    B   A car park contains 5 cars. The arrival of cars is Poisson with a mean rate of   **[7M]** 10 per hour. The length of time each car spends in the car park has negative exponential distribution with mean 2 hours. How many cars are in the car park on average and what is the probability of a newly arriving customer

finding the car park full and having to park his car elsewhere?

<div align="center">OR</div>

10 **A** The transition probability matrix of a Markov chain $\{x_n\}$; $n = 1,2,3, \ldots$ **[10M]**
having three states 1,2,3 is $\begin{bmatrix} 0.1 & 0.5 & 0.4 \\ 0.6 & 0.2 & 0.2 \\ 0.3 & 0.4 & 0.3 \end{bmatrix}$ and the initial distribution is
$P^{(0)} = \{0.7, 0.2, 0.1\}$ then find $P = \{X_3 = 2, X_2 = 3, X_1 = 3, X_0 = 2\}$

B The transition probability matrix of a Markov chain is given by **[4M]**
$\begin{bmatrix} 0.3 & 0.7 & 0 \\ 0.1 & 0.4 & 0.5 \\ 0 & 0.2 & 0.8 \end{bmatrix}$. Is this Matrix irreducible?

<div align="center">***</div>

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
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II B.Tech I Semester Supplementary Examinations, January 2024
Electronic Devices and Circuits
(EEE, CSE & IT)

Roll No										

Time: 3 hours   **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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SECTION-I

1 **A** Examine V-I Characteristics of Si-Diode with Forward Bias and Reverse Bias. **[7M]**

  B Explain the operation of Tunnel Diode with the help of band diagrams in forward and reverse bias conditions. **[7M]**

OR

2 **A** Differentiate diffusion and transition capacitances of the junction diode. **[7M]**

  B Find the maximum and minimum current flowing through the Zener diode, for the Zener regulator shown in following figure. **[7M]**
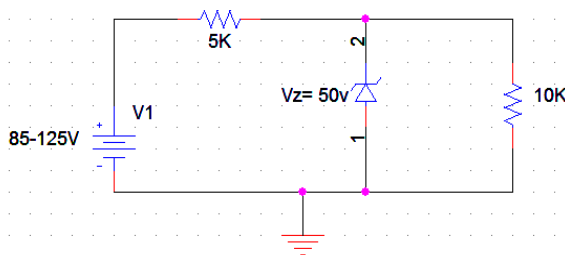
SECTION-II

3 **A** Discuss about half wave rectifier with neat circuit diagram and derive the expressions RMS Voltage, Average Current and Ripple factor. **[7M]**

  B A bridge rectifier is directly operated on the single phase AC supply voltage of 230 V, 50Hz. If the load resistance is 100 Ω and diode forward resistance is 1Ω. Calculate the following: **[7M]**
  i.   Average load voltage
  ii. DC power output
  iii. AC power input
 iv. Rectifier efficiency

OR

4 **A** Explain the operation of π-section filter in a Full wave Rectifier. **[7M]**

  B Calculate value of capacitance to use in a capacitor filter connected to a full-wave rectifier operating at a standard aircraft power frequency of 400 Hz, if the ripple factor is 10% for a load of 500Ω. **[7M]**

SECTION-III

5 **A** Explain the Current components of Bipolar Junction Transistor. **[7M]**

B Why does a transistor demonstrate amplification exclusively in its active region, and not in the saturation or cut-off regions? **[7M]**

OR

6 **A** Discuss about current amplification factors of transistor and derive the relations between alpha, beta and gamma. **[7M]**

B A transistor has I_B= 100µA and I_C = 2mA. Find. **[7M]**
i) β of the transistor
ii) α of the transistor
iii) Current I_E
iv) If I_B changes by +25µA and I_C changes by +0.6mA, find new value of β

SECTION-IV

7 **A** Demonstrate the concept of "Thermal Runaway" and explain how to overcome it. Relate the condition for thermal stability in CE configuration. **[7M]**

B Determine the I_{CQ} and V_{CEQ} for the given circuit as shown in following figure. **[7M]**
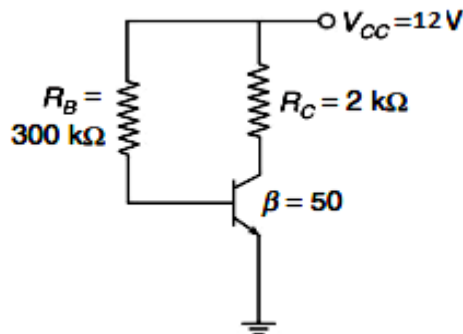
OR

8 **A** Illustrate with the help of a neat circuit diagram, the principle operation of Voltage Divider Bias arrangement. Relate the expression for S and infer how the stability factor can be improved. **[7M]**

B Determine the operating point values and Stability factor of Silicon transistor circuit with a fixed bias, V_{cc}=12V, R_c=3KΩ, R_B=8KΩ, β=50, V_{BE}=0.7V. **[7M]**

SECTION-V

9 **A** Analyze and contrast the characteristics and operational principles of JFETs. **[7M]**
B Draw the self-bias circuit using JFET. What measures does the self-biasing mechanism employ to ensure a stable operating point in the face of variations in the JFET's parameters, such as trans conductance? **[7M]**

OR

10 **A** Explain the parameters trans-conductance gm. Drain resistance rd and amplification factor (μ) of a JFET. Establish a relation between them. **[7M]**

B Explain the key characteristics and operational principles of the Common Source Amplifier using a FET **[7M]**

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