

- (b) The table given below shows the data obtained during outbreak of smallpox:

(7M) CO3

	Attacked	Not Attacked	Total
Vaccinated	31	469	500
Not Vaccinated	185	1315	1500
Total	216	1784	2000

Test the effectiveness of vaccination in preventing the attack. Test your result with the help of  $\chi^2$  at 5% and 1% level of significance.

#### UNIT – IV

8. (a) Suppose playing four rounds of golf at the city club 11 professionals totalled 280, 282, 290, 273, 283, 283, 275, 284, 282, 279 and 281. Use the sign test at 5% level of significance to test the null hypothesis that professional golfer's average is 284 for four rounds against the alternative hypothesis average is less than 284.

(7M) CO4

- (b) The following is the arrangement of defective,  $d$ , and non defective,  $n$ , pieces produced in the given order by a certain machine:

$nmmmddddnmmmmmmmdnndddd$

Test for randomness at the 0.01 level of significance.

(7M) CO4

(OR)

9. (a) The values in one sample are 53, 38, 69, 57, 46, 39, 73, 74, 60 and 78. In another sample they are 44, 40, 61, 52, 32, 44, 70, 41, 67, 72, 53 and 72. Test at the 10% level the hypothesis that they come from population with the same mean. Apply U test.

(7M) CO4

- (b) Fit a trend to the following data and estimate the value of  $y$  for  $x = 11$

(7M) CO4

x	1	2	3	5	7	9
y	19	37	61	127	217	331

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CM/CS/IT211 (R20)

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CM/CS/IT211 (R20)

B. TECH. DEGREE EXAMINATION, MARCH-2023  
Semester III [Second Year] (Regular & Supplementary)

#### PROBABILITY AND STATISTICS

Time: Three hours

Maximum Marks: 70

Answer Question No.1 compulsorily. (4 x 1 = 14)

Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:

- (a) If  $X$  is a Poisson variable such that  $P(X = 2) = 9P(X = 4) + 90P(X = 6)$ . Then find the mean of the  $X$ . CO1
- (b) If  $X$  is a discrete random variable having the probability distribution, then find  $k$  and then find  $P(2 < X < 4)$  CO1

x	1	3	5	7
p(x)	k	3k	5k	7k

- (c) If the chance that one of the ten telephone line is busy at an instant is 0.2. What is the chance that 5 of the lines are busy? CO1
- (d) What is a level of significance? CO2
- (e) What is one tailed and two tailed test? CO2
- (f) What is the test statistic for the estimation of mean for small size samples when population is normally distributed? CO2
- (g) What is the test statistics for estimating population mean for large sample size when population is finite and normally distributed? CO3
- (h) For estimation of population proportion from sample proportion which test one can apply? CO3
- (i) When F test can be applied? CO3
- (j) To test randomness of the selection of samples which test can be applicable? CO4
- (k) Write the formula of Spearman's rank correlation coefficient. CO4
- (l) Write the formula of Kendall's coefficient of concordance  $W$  for tied ranks? CO4
- (m) What is the range of Spearman's rank correlation coefficient? CO4
- (n) Define Time series. CO4

### UNIT – I

2. (a) If 3 of 20 tyres are defective and 4 of them are randomly chosen for inspection. What is the probability that only one of the defective tyres will be included? (7M) CO1
- (b) The daily consumption of milk in a city in excess of 20,000 gallons is approximately distributed as Gamma variable with parameters  $k = 2$  and  $\lambda = 0.0001$ . The city has a daily stock of 30,000 gallons. What is the probability that the stock is insufficient on a particular day? (7M) CO1

(OR)

3. (a) Ten coins are tossed 1024 times. Find the following frequency observed. Fit a Binomial distribution. (7M) CO1

No. of heads	0	1	2	3	4	5	6	7	8	9	10
Frequency	2	10	38	106	188	257	226	128	59	7	3

- (b) If the probability distribution of X is given as

x	1	2	3	4
p(x)	k	2k	3k	4k

Find

- (i) The value of k.
- (ii)  $P(x \text{ being a prime number})$
- (iii)  $P(0.5 < X < 2.5/x > 1)$

### UNIT – II

4. (a) In a random selection of 64 out of 2400 intersections in a small city, the mean number of scooter accidents per year was 3.2 and sample standard deviation was 0.8. Find the 90% confidence interval for the mean number of accidents per intersection per year. Assume normality. (7M) CO2
- (b) The foreman of ABC mining company has estimated the average quantity of iron ore extracted to be 36.8 tons per shift and the sample standard deviation to be 2.8 tons per shift, based upon a random selection of 4 shifts. Construct a 90% confidence interval around this estimate using t distribution. (7M) CO2

(OR)

5. (a) The mean of a certain production process is known to be 50 with a standard deviation of 2.5. The production manager may welcome any change in mean value towards higher side but would like to safeguard against decreasing values of mean. He takes a sample of 12 items that gives a mean value of 48.5. What inference should the manager take for the production process based on sample results? Significance level is 5%. (7M) CO2

- (b) The mean produce of wheat of a sample of 100 fields in 200 lbs. per acre with a standard deviation of 10 lbs. Another samples of 150 fields gives the mean of 220 lbs. with a standard deviation of 12 lbs. Can the two samples be considered to have been taken from the same population whose standard deviation is 11 lbs? Use 5% level of significance. (7M) CO2

### UNIT – III

6. (a) Weight of 10 students is as follows: (7M) CO3

No.	1	2	3	4	5	6	7	8	9	10
Weight (kg.)	38	40	45	53	47	43	55	48	52	49

Can we say that the variance of the distribution of weight of all students from which the above sample of 10 students was drawn is equal to 20 kgs? Test this at 1% level of significance.

- (b) Two random samples drawn from two normal populations are: (7M) CO3

Sample 1: 20 16 26 27 23 22 18 24 25 19

Sample 2: 27 33 42 35 32 34 38 28 41 43 30 37

Test using variance ratio at 5% level of significance whether the two population have the same variance?

(OR)

7. (a) A drug research experimental unit is testing between two drugs, newly developed to reduce blood pressure. The drugs are given to 2 different sets of animals. In group 1, 350 of 600 animals tested respond to drug 1 and in group 2, 260 of 500 animals tested respond to drug 2. The research unit wants to test whether there is a difference between efficiency of the sample of drugs at 5% level of significance? (7M) CO3

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CD/CM/CO/CS/IT212 (R20)

B.TECH. DEGREE EXAMINATION, MARCH-2023

Semester III [Second Year] (Regular & Supplementary)

### DISCRETE MATHEMATICS

Time: Three hours

Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)

Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:

- |   |     |
|---|-----|
| (a) Define tautology. Give suitable example.  | CO1 |
| (b) What is bijective function?   | CO1 |
| (c) Define Modus Tollens.   | CO1 |
| (d) Define product rule of counting.  | CO2 |
| (e) Find the number of permutations of the word TALLAHASSEE.  | CO2 |
| (f) In how many ways can 30 people arranged in a circle.  | CO2 |
| (g) Determine the value of $a_2$ for the recurrence relation $a_n = 17a_{n-1} + 30n$ with $a_0 = 3$ . | CO3 |
| (h) Write the recursive algorithm for finding the sum of first $n$ positive numbers.                  | CO3 |
| (i) Find the coefficient of $x^{16}$ in the expression $(x^0 + x^4 + x^8)$                            | CO3 |
| (j) Define transitive relation.   | CO4 |
| (k) Define isomorphism.   | CO4 |
| (l) What is planar graph?   | CO4 |
| (m) State Euler's circuit.  | CO4 |
| (n) What is four color problem?   | CO4 |

### UNIT - I

2. (a) Prove that  $[(p \wedge \sim q) \rightarrow r] \rightarrow [p \rightarrow (q \vee r)]$  is a tautology. (Using truth table) (7M) CO1
- (b) Prove that  $R$  is transitive if and only if  $R^n \subseteq R$ . (7M) CO1

(OR)

3. (a) Prove by mathematical induction that  $6^{n+2} + 7^{2n+1}$  is divisible by 43 for all +ve integers. (7M) CO1
- (b) Prove or disprove the validity of the following argument using Rules of Inference.  
If Socrates is a man, then Socrates is mortal.  
Socrates is a man.  
Therefore, Socrates is mortal. (7M) CO1

#### UNIT – II

4. (a) How many integral solutions are there to the equation  $x_1 + x_2 + x_3 + x_4 + x_5 = 20$  where  $x_1 \geq 3, x_2 \geq 2, x_3 \geq 4, x_4 \geq 6, x_5 \geq 0$  (7M) CO2
- (b) How many different license plates are there (allowing repetitions)  
Involving 3 letters and 4 digits if 3 letters must appear together either at beginning or at the end of plate.  
Involving 1, 2, or 3 letters and 1, 2, 3 or 4 digits if the letters must occur together. (7M) CO2

(OR)

5. (a) How many numbers can be formed using the digits 1, 3, 4, 5, 6, 8 and 9. If no repetitions are allowed. (7M) CO2
- (b) 5 boys and 5 girls are to be arranged around a circular table for a discussion so that the boys and girls alternatively. In how many ways can they be seated? (7M) CO2

#### UNIT – III

6. (a) Evaluate the coefficient of  $x^{20}$  in  $(x^2 + x^3 + x^4 + x^5 + x^6)^7$ . (7M) CO3
- (b) Evaluate the coefficient of  $x^{14}$  in  $(1 + x + x^2 + x^3)^{10}$  (7M) CO3

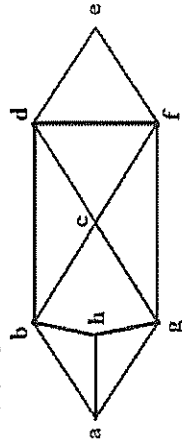
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(OR)

7. (a) Solve the recurrence relation  $a_n = 6a_{n-1} - 9a_{n-2}$ ,  $n \geq 2$  where  $a_0 = 2, a_1 = 3$ . (Use Characteristics roots method) (7M) CO3
- (b) Solve the recurrence relation  $a_n - 5a_{n-1} + 6a_{n-2} = 8n^2$ , where  $a_0 = 4, a_1 = 7$ . (7M) CO3

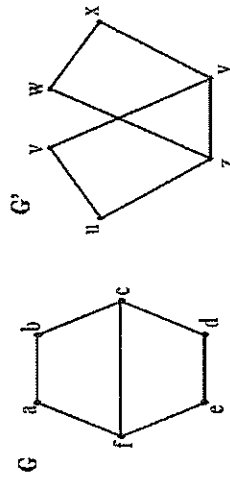
#### UNIT – IV

8. (a) Evaluate the Chromatic number for the  $K_{3,4}$ . (7M) CO4
- (b) Determine the Hamiltonian Circuit for the following graph. (7M) CO4



(OR)

9. (a) Determine whether the following graphs G and G' Isomorphic or not. (7M) CO4



- (b) Draw the Hasse-diagram for the POSET [D<sub>36</sub>, /]. Where '/' is the divisibility relation. Determine this POSET is lattice or not. (7M) CO4

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CD/CM/CS/IT213 (R20)

B.TECH. DEGREE EXAMINATION, MARCH-2023

Semester III [Second Year] (Regular & Supplementary)

**COMPUTER ORGANIZATION**

Time: Three hours

Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)

Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:

- |  |     |
|--|-----|
| (a) Write the functional units of a computer.  | CO1 |
| (b) What is called the subroutine linkage method?  | CO1 |
| (c) What is the purpose of program counter?  | CO2 |
| (d) Write sequence of actions needed to fetch and execute an unconditional branch instruction. | CO2 |
| (e) What is the difference between LOAD and STORE?   | CO2 |
| (f) Define data hazard.  | CO3 |
| (g) Write any two pipelining issues.   | CO3 |
| (h) What is memory delay?  | CO3 |
| (i) Define an interrupt.   | CO4 |
| (j) What is program controlled I/O?  | CO4 |
| (k) What is memory mapped I/O?   | CO5 |
| (l) Define handshake protocol.   | CO5 |
| (m) Differentiate between static RAM and dynamic RAM.  | CO6 |
| (n) Define locality of reference.  | CO6 |

**UNIT - I**

- |   |      |     |
|---|------|-----|
| 2. (a) Explain basic functional units of a computer.                  | (7M) | CO1 |
| (b) Explain about Instruction Execution and Straight-Line Sequencing. | (7M) | CO1 |

(OR)

3. (a) Convert the following pairs of decimal numbers to 5 bit 2's complement numbers then perform addition and subtraction on each pair. Indicate whether or not overflow occurs for each case. (7M) CO1
  - (i) 7 and 13
  - (ii) -12 and 9
- (b) Explain RISC type addressing modes with examples. (7M) CO1

#### UNIT – II

4. (a) Describe Instruction Execution steps for
  - (i) LOAD instructions (7M) CO2
  - (ii) STORE instructions
- (b) Illustrate pipeline organization in detail with a neat sketch. (7M) CO3

(OR)

5. (a) Discuss about memory delays in pipelining. (7M) CO3
- (b) Discuss Hardwired control with neat sketch. (7M) CO2

#### UNIT – III

6. (a) Discuss in detail about Processor Control Registers. (7M) CO4
- (b) With a neat sketch explain bus arbitration. (7M) CO4

(OR)

7. (a) Explain about enabling and disabling interrupts. (7M) CO4
- (b) Explain use of a PCI bus in a computer system with a neat sketch. (7M) CO4

#### UNIT – IV

8. (a) Explain about Direct Memory Access. (7M) CO6
- (b) With a neat sketch explain the functionality of a 4-bit carry-look ahead adder. (7M) CO6

(OR)

9. (a) Illustrate Booth's algorithm with an example. (7M) CO6
- (b) Explain Direct-Mapped Cache in detail. (7M) CO6

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CD/CM/CS/IT213 (R20)

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CS/IT214 (R20)

**B.TECH. DEGREE EXAMINATION, MARCH-2023**

Semester III [Second Year] (Regular & Supplementary)

**DATA STRUCTURES**

Time: Three hours Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)  
 Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:

- (a) Define an algorithm and mention its characteristics. CO1
- (b) What is asymptotic complexity of an algorithm? CO1
- (c) Determine the time complexity of the following code fragment: CO1

```

int a = 0, i = N;
while(i > 0) {
    a += i;
    i = i-1;
}
    
```

- (d) Give the best and worst case time complexity of insertion sort. CO2
- (e) What is a collision? CO2
- (f) How do you test whether a linked list is empty or not? CO3
- (g) What are the applications of stack? CO3
- (h) Define Queue ADT. CO3
- (i) Convert the given infix expression to postfix expression. CO4  
 $(a * b) + (c / d) + f - (g * h)$
- (j) Queue overflow condition is not checked in linked queue. Give reason. CO3
- (k) Mention the properties of a B-tree. CO3
- (l) What is a height balanced tree? CO3
- (m) Write the applications of tree. CO3
- (n) How can you define a path in a graph? CO3

### UNIT – I

2. (a) Write the pseudo code to implement transpose of a matrix. Determine its time complexity using step count method. (7M) CO1
- (b) Explain binary search technique with suitable example. Give its time complexity analysis. (7M) CO1,2

(OR)

3. (a) What is meant by space complexity of an algorithm? What is its purpose? How do you determine it? (7M) CO1
- (b) Describe selection sort algorithm and trace its steps for sorting the list 12, 19, 33, 26, 29, 35, 22, 37. (7M) CO2

### UNIT – II

4. (a) What is a linked list? Describe different types of linked lists. Mention the advantages and disadvantages of linked lists over arrays. (7M) CO3
- (b) Write and explain a function to insert an element anywhere in a doubly linked list. (7M) CO3

(OR)

5. (a) What is hashing? Discuss different hashing functions. (7M) CO2
- (b) Consider the given values 72, 27, 36, 24, 63, 81, 92, 101 and perform linear, quadratic probing operations in a given hash table of size 10. (7M) CO2

### UNIT – III

6. (a) Evaluate the postfix expression  $7\ 3\ 4\ +\ -\ 2\ 4\ 5\ /\ +\ *6\ /\ 7\ +$ . Describe each step of the process. (7M) CO4
- (b) Write an algorithm for basic operations of stack. (7M) CO3

(OR)

7. (a) Describe the steps to implement queue using array. (7M) CO4
- (b) Explain how to implement basic operations of linked queue with examples. (7M) CO3

### UNIT – IV

8. (a) What is a Binary Search Tree? Explain the basic operations performed on it. (7M) CO3
- (b) Construct a MaxHeap with the following values: 23, 7, 92, 6, 12, 14, 40, 44, 20, 21. Show the resulting heap after each step. (7M) CO3

(OR)

9. (a) Define graph. Explain graph representation techniques with suitable example. (7M) CO3
- (b) Construct a B-tree of order 3 from the following list of data items 5, 6, 8, 21, 12, 30, 34, 27, 23, 4, 33, 7, 24, 9, 10, 11, 13, 38. (7M) CO3

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CS/IT214 (R20)