

*…3rd … Sem (Regular)*

**Discrete Mathematics**

**MA 2013**

(Branch)

**AUTUMN END SEMESTER EXAMINATION-2019**

3­rd  Semester B.Tech & B.Tech Dual Degree

**­Discrete Mathematics**

**MA 2013**

(For 2018 Admitted Batches)

Time: 3 Hours Full Marks: 50

***Answer any SIX questions.***

***Question paper consists of four sections-A, B, C, D.***

***Section A is compulsory.***

***Attempt minimum one question each from Sections B, C, D.***

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.*

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| --- | --- | --- | --- | --- |
| **SECTION-A** | | | | |
| 1. |  |  | [110] | |
|  | (a) | Tell the truth value of the statement “if monkey can fly then Rahul is in Japan” with reason. | |  |
|  | (b) | Recall the law of resolution in rules of inference. | |  |
|  | (c) | Find a domain for which the statement “” is true. | |  |
|  | (d) | List the order pairs in the equivalence relation produced by the partition and of . | |  |
|  | (e) | Find least upper bound and greatest lower bound of in the poset . | |  |
|  | (f) | Classify the function , defined by for all , as one-one, onto or both one-one and onto. | |  |
|  | (g) | Explain the generating function for the numerical sequence . | |  |
|  | (h) | Give an example of a semigroup which is not a group. | |  |
|  | (i) | Find an example of normal subgroup. | |  |
|  | (j) | Find the inverses of 4 in the field . | |  |
| **SECTION-B** | | | | |
| 2. | (a) | Show that the compound proposition is a contradiction. | | [4] |
|  | (b) | Applying method of substitution, find the numeric sequence that satisfy the recurrence relation for . | | [4] |
|  |  |  | |  |
| 3. | (a) | 1. Find and , where and , are functions from to . 2. Identify whether the permutation is even or odd. | | [4] |
|  | (b) | Show that the set of all even integers is semigroup under usual multiplication. Is it a monoid? | | [4] |
|  |  |  | |  |
| **SECTION-C** | | | | |
| 4. | (a) | Assume for with and . Show that using strong induction. | | [4] |
|  | (b) | Apply Warshall’s Algorithm to find the transitive closure of the relation  on {1*,* 2*,* 3*,* 4}. | | [4] |
|  |  |  | |  |
| 5. | (a) | Show that the inclusion relation is a partial ordering on the power set of a set. Draw the Hasse diagram for this partial ordering on the power set of . | | [4] |
|  | (b) | Construct examples of a distributive lattice and a complemented lattice. | | [4] |
|  |  |  | |  |
| 6. | (a) | Let be the set of all nonzero real numbers and let . Test for an abelian group. | | [4] |
|  | (b) | (i) Define zero divisor in a ring. Identify a zero divisor in the ring of all real matrices under usual addition and multiplication of matrices  (ii) Define an integral domain with suitable examples. | | [4] |
| **SECTION-D** | | | | |
| 7. | (a) | Examine whether these system specifications are consistent:  “The diagnostic message is stored in the buffer or it is retransmitted.”  “The diagnostic message is not stored in the buffer.”  “If the diagnostic message is stored in the buffer, then it is retransmitted.” | | [4] |
|  | (b) | Let denote the number of moves needed to solve the Tower of Hanoi problem with disks. Determine a recurrence relation for the sequence and solve using generating function. | | [4] |
|  |  |  | |  |
| 8. | (a) | Let be a positive integer and a set of all bit strings. Construct an equivalence relation on . What are the sets in the partition of arising from the relation on ? | | [4] |
|  | (b) | Let be a group. Prove that the function defined by is a homomorphism if and only if is abelian. | | [4] |
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**MAPPING OF QUESTIONS WITH COURSE OUTCOMES AND LEARNING LEVELS**

The paper setter /Moderator will provide mapping of Question with Course Outcomes and learning levels in the following format:

Course Name: Discrete Mathematics

Course code: MA 1013

Examination: AUTUMN END SEMESTER 2019

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| --- | --- |
| CO1 | convert sentences in natural language into mathematical statements, understand predicate and quantifiers, rules of inference and prove results by principle of mathematical induction. |
| CO2 | understand the principles of inclusion and exclusion of sets, concept of relations and functions and solve related problems. |
| CO3 | know the concepts of partition of sets, partial ordering relation, Hasse diagram and Lattice. |
| CO4 | solve problems on recurrence relations by substitution and method of generating functions. |
| CO5 | understand the concept of algebraic structures, semi groups, group, subgroups and proof of Lagrange theorem. |
| CO6 | gets the idea of homomorphism and isomorphism of groups, |

Rows may be added or deleted as necessary

|  |  |  |
| --- | --- | --- |
| Question number | Course Outcome number | Learning Level (Blooms taxonomy) |
| ***Section A*** | | |
| Q1a | CO1 | L1; Tell |
| 1b | CO1 | L1; Recall |
| 1c | CO2 | L1; Find |
| 1d | CO3 | L1; List |
| 1e | CO3 | L1; Find |
| 1f | CO2 | L2; Classify |
| 1g | CO4 | L2; Explain |
| 1h | CO5 | L2; example |
| 1i | CO5 | L1; Find |
| 1j | CO5 | L2; Find |
| ***Section B*** |  |  |
| Q2a | CO1 | L2; Show |
| 2b | CO2 | L3; Applying |
| Q3a | CO4 | L3; Identify |
| 3b | CO5 | L2; Show |
| ***Section C*** | | |
| Q4a | CO1 | L4; Assume |
| 4b | CO2 | L3;apply |
| Q5a | CO3 | L4; draw |
| 5b | CO3 | L3; Construct |
| Q6a | CO5 | L4; Test for |
| 6b | CO5 | L3; Identify |
| ***Section D*** | | |
| Q7a | CO1 | L4; Examine |
| 7b | CO4 | L5; Determine |
| Q8a | CO3 | L6; Construct |
| 8b | CO6 | L5; Prove |

***Signature of Paper Setter/Moderator***