**20CS206/IT206/CB205/DS205/CM205**

**Hall Ticket Number:**

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| **I/IV B.Tech (Regular\Supplementary) DEGREE EXAMINATION** | | | |
| **August, 2023** | **Common to CSE, IT, CB, DS & CM** | | |
| **Second Semester** | **Discrete Mathematical Structures** | | |
| **Time:** Three Hours | | **Maximum:** 70 Marks | |
| ***Answer question 1 compulsory.*** | | | **(14X1 = 14Marks)** |
| ***Answer one question from each unit.*** | | | **(4X14=56 Marks)** |
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|  |  |  | CO | BL | M |
| 1 | a) | What is an anti symmetric relation. Give an example. | CO1 | L1 | 1M |
|  | b) | Is the relation R={(1,1) (1,2) (2,3) (2,2) (3,3)} on A={1,2,3} symmetric and transitive. | CO1 | L1 | 1M |
|  | c) | Give converse, inverse, and contrapositive to the implication p🡪q. | CO1 | L1 | 1M |
|  | d) | State law of hypothetical syllogsiam. | CO1 | L1 | 1M |
|  | e) | Write all 3 combinations of (∞.a, ∞.b, ∞.c, ∞.d} | CO2 | L1 | 1M |
|  | f) | Write formula for finding r-permutations with unlimited repetitions. | CO2 | L1 | 1M |
|  | g) | Symbolize the sentence “All birds can fly”. | CO2 | L1 | 1M |
|  | h) | Define recurrence relation. | CO3 | L1 | 1M |
|  | i) | Give the generation function for **1/(1-X)2** | CO3 | L1 | 1M |
|  | j) | Give the characteristic polynomial for the recurrence relation **an-7an-1 + 10an-2 = 0.** | CO3 | L1 | 1M |
|  | k) | Define method of undermined coefficients. | CO4 | L1 | 1M |
|  | l) | Define a Lattice | CO4 | L1 | 1M |
|  | m) | Draw the Hasse diagram for (**D20; |** ) | CO4 | L1 | 1M |
|  | n) | Define the degree of a vertex in a digraph. | CO4 | L1 | 1M |
| **Unit-I** | | | | | |
| 2 | a) | Construct a truth table for the statement:  (i) (p ∨ (q→ r)) → ((p ∨ ∼r) → q). (ii) (p∧q)∨(~p∧ q) ∨ (p ∧ ~q) ∨ (~p ∧ ~q) | CO1 | L3 | 7M |
|  | b) | Prove the validity of the following argument. | CO1 | L3 | 7M |
|  |  | **(OR)** |  |  |  |
| 3 | a) | prove that [(p→(q→ s))∧ (∼r ∨p)∧ q]→ (r→ s) is a tautology | CO1 | L3 | 7M |
|  | b) | If P is an odd prime, then show that P has the form 6n+1 or 6n+5 or P=3 | CO1 | L2 | 7M |
| **Unit-II** | | | | | |
| 4 | a) | Using the mathematical induction prove that 1.3+2.4+3.5+…n(n+2) =(n+1)(2n+7) | CO2 | L2 | 7M |
|  | b) | **P.T.O**  Prove or disprove the validity of the following arguments  **20CS206/IT206/CB205/DS205/CM205**  Every living thing is a plant or an animal.  David’s dog is alive and it is not a plant.  All animals have hearts.  Hence, David’s dog has a heart. | CO2 | L3 | 7M |
| **(OR)** | | | | | |
| 5 | a) | How many different numbers can be formed from the digits 0,2,3,4,5,6 lying between 100 and 1000 and how many of these will be divisible by 5? | CO2 | L3 | 7M |
|  | b) | How many integral solutions are there **to x1+x2+x3+x4+x5=20** where **x1≥1, x2≥0, x3≥2, x4≥2, x5≥2?** | CO2 | L2 | 7M |
| **Unit-III** | | | | | |
| 6 | a) | In (1+X5+X9)10 find (i) the coefficient of X23 (ii) the coefficient of X32. | CO3 | L2 | 7M |
|  | b) | Solve the recurrence relation an – 9an-1 + 26an-2 – 24an-3 = 0 for n≥ 3. | CO3 | L3 | 7M |
| **(OR)** | | | | | |
| 7 | a) | Solve the recurrence relation **an-7an-1 + 10an-2 = 0** for n≥2where a0=10 and a1=41 by using method of characteristic roots. | CO3 | L3 | 7M |
|  | b) | Find the coefficient of **X8** in **(1+X+X2+….)3** | CO3 | L2 | 7M |
| **Unit-IV** | | | | | |
| 8 | a) | Solve the recurrence relation an – 5 an-1+6 an-2 = 4n for n≥ 2. | CO4 | L3 | 7M |
|  | b) | Find the particular solution of the recurrence relation an- 4an-1 +4an-2 = 2n. | CO4 | L3 | 7M |
| **(OR)** | | | | | |
| 9 | a) | For the poset S = { (6, 8, 12, 18, 27, 48), / }, find i) Maximal elements. ii) Minimal elements.(iii)Least upper bound of {12, 18}, if it exists. Greatest lower bound of {8,12}, if it exists. | CO4 | L3 | 7M |
|  | b) | Using Warshalls algorithm, compute the adjacency matrix of the transitive closure of the digraph G = ({a,b,c,d,e},{(a,b), (b,c),(c,d),(d,e),(e,d)} | CO4 | L3 | 7M |

