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| **Velegapudi Ramakrishna Siddhartha Engineering College::Vijayawada**  **(Autonomous)**  II /IV B Tech Degree Examinations  Third Semester  **Department of Mathematics**  **20ES3102 DISCRETE MATHEMATICAL STRUCTURES** | | | | | | | |
| Time:3Hrs | | | **MODEL QUESTION PAPER** | | Max Marks:70 | | |
| Part – A is Compulsory  Answer one (01) question from each unit of Part – B  Answers to any single question or its part shall be written at one place only | | | | | | | |
| ***Cognitive Levels(K): K1-Remember;K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create*** | | | | | | | |
| **Q. No** | | **Question** | | **Marks** | | **Course Outcome** | **Cog. Level** |
| **Part - A** | | | | **10X1=10M** | | | |
| 1 | a | Define propositional function. | | 1 | CO1 | | K1 |
|  | b | Define Universe of Discourse. | | 1 | CO1 | | K1 |
|  | c | Define quantifiers. | | 1 | CO1 | | K1 |
|  | d | How many ways the sum can be obtained of 8 when two indistinguishable dice are rolled | | 1 | CO2 | | K1 |
|  | e | Is the “divides” relation on the set of positive integers reflexive? | | 1 | CO2 | | K1 |
|  | f | Define partially ordered set. | | 1 | CO3 | | K1 |
|  | g | Define a group and give an example. | | 1 | CO3 | | K1 |
|  | h | Define group homomorphism. | | 1 | CO3 | | K5 |
|  | I | Define Planar graph. | | 1 | CO4 | | K1 |
|  | j | What is a Graph coloring? | | 1 | CO4 | | K2 |
| **Part - B** | | | | **4X15 =60M** | | | |
| **UNIT - I** | | | | | | | |
| 2 | a | Obtain the truth table for the following proposition:  ((p→~q) →r))→ (r→ (q∨ r)). | | 7M | CO1 | | K3 |
|  | b | Test the validity of the following argument.  All the integers are rational numbers.  Some integers are power of 2.  Therefore, some rational numbers are powers of 2. | | 8M | CO1 | | K5 |
| **(OR)** | | | | | | | |
| 3 | a | If P is an odd prime, then show that P has the form 6n+1 or 6n+5 or P=3 | | 7M | CO1 | | K3 |
|  | b | Find the number of solutions of e1+ e2+ e3= 17 where 0 <ei for each i, with 2≤ e1≤ 5, 3≤ e2 ≤ 6, 4 ≤ e3 ≤ 7 | | 8M | CO1 | | K3 |
| **UNIT - II** | | | | | | | |
| 4 | a | Let m be a positive integer with m> 1. Show that the relation R= { (a,b) / a ≡b (mod m) } is an equivalence relation on the set of integers. | | 7M | CO2 | | K5 |
|  | b | Solve the recurrence relation an – 5 an-1+6 an-2 = 4n for n≥ 2. | | 8M | CO2 | | K5 |
| **(OR)** | | | | | | | |
| 5 | a | Find the solution to the recurrence relation an = 6 an-1 - 11 an-2 +6 an-3 for n≥ 3. | | 7M | CO2 | | K3 |
|  | b | Draw the Hasse diagram for the partial ordering {(A, B) / A ⊆ B} on the power set P(S), where S = { a,b,c}  . | | 8M | CO2 | | K5 |
| **UNIT - III** | | | | | | | |
| 6 | a | Let (G,\*) be a group. Then the following hold good:  (1) (x\*y)-1= y -1 \* x -1 for all x, y in G**.**  (2) x \* y = x \* z → y = z ( Left cancellation law)  (3) y \* x = z \* x → y = z ( Right cancellation law)  (4) For any two elements a, b of G, the linear equation  a \* x =b and x \* a =b have unique solutions in G    (5) e is only idempotent element in G. | | 7M | CO3 | | K3 |
|  | b | Let f: G ⟶ G’ be a group homomorphism from ( G,\*) to ( G’, o). Let e and e’ be the identity elements of G and G’ then (i) f(a) = e’ (ii) f(a-1) = (f(a))-1 for all a in G. (iii) f(a\*b-1) = f(a) o ( f(b))-1  for all a, b in G . (iv) f(H) is a subgroup of G whenever H is a subgroup of G.**.** | | 8M | CO3 | | K3 |
| **(OR)** | | | | | | | |
| 7 | a | Show that any subgroup of a cyclic group (G,\*) is cyclic . | | 7M | CO3 | | K3 |
|  | b | A finite group (G,\* ) of order n is isomorphic to a group of permutations of G **.** | | 8M | CO3 | | K3 |
| **UNIT - IV** | | | | | | | |
| 8 | a | If G is a connected graph then show that + = 2 Where denotes the number of vertices of G, denotes the number of edges of G denotes the number of regions of G. | | 7M | CO4 | | K3 |
|  | b | Use Grinberg’s theorem to show that there are no planar Hamiltonian graphs with regions of degree 5,8,9 and 11 with exactly one region with degree 9. | | 8M | CO4 | | K5 |
| **(OR)** | | | | | | | |
| 9 | a | Prove that, a complete graph Kn is planner if and only if n ≤ 4. | | 7M | CO4 | | K3 |
|  | b | Show that the digraphs D1 and D2 given in figure are isomorphism | | 8M | CO4 | | K3 |

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| **Designation** | **Name in Capitals** | **Signature with Date** |
| **Course Coordinator** | Dr. E.S.R.RAVI KUMAR |  |
| **Module Coordinator** |  |  |
| **Program Coordinator** |  |  |
| **Head of the Department** | Dr. Ch. BABY RANI |  |