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| **UNIT-I (Short Answer Questions. Each 2 Marks)** | | |
| Q.No. | Question |  |
| 1 | Explain about logical connective Biconditional. |
| 2 | Explain about logical equivalence. |
| 3 | Define Duality law. |
| 4 | Define well-formed formula |
| 5 | Define i) tautology ii) contradiction. |
| 6 | Define universal quantifier |
| 7 | Define existential quantifier |
| 8 | Define PDNF & PCNF. |
| 9 | Write the minterms of three proposition p,q,r |
| 10 | Define Demorgan’s law |

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| **UNIT-I (Long Answer Questions. Each 10 Marks)** | | | | | |
| Q.No. | | Question | |  | |
| 1.(i) | | Prove that {𝑝→(𝑞→𝑟)}→{(𝑝→𝑞)→(𝑝→𝑟)}is a tautology | |
| 1.(ii) | | Prove that for any three propositions p, q, r  ¬ [𝑝∨ (q ∧ r)] ↔ [(𝑝˅𝑞) ∧ (𝑝˅r)]. | |
| 2.(i) | | Construct the truth table for the compound proposition (𝑝→𝑟) ∧ [(𝑞∧¬𝑟) → (𝑝∨ 𝑟)]. | |
| 2.(ii) | | Define converse, inverse and contrapositive of the implication and write converse, inverse and contrapositive of the implication statement.  “If today is a holiday, then I will go for a movie”. | |
| 3.(i) | | Prove that for any three proposition p, q, r the conditional  {(𝑝→𝑞) ∧ (𝑞→𝑟)}.→ (𝑝→r) is a tautology. | |
| 3.(ii) | | Obtain the PCNF of (¬𝑝→𝑟)∧ (𝑞↔p) and hence find PDNF | |
| 4.(i) | | Explain in detail about the logical connectives with examples | |
| 4.(ii) | | Prove that (¬ 𝑝↔𝑞) ⇔ (𝑝∨ 𝑞) ∧ ¬ (𝑝∧𝑞). | |
| 5.(i) | | Prove that for any three propositions p, q, r  {[𝑝∨ (q˅r)]} ∧¬ 𝑞 (𝑝˅r) | |
| 5.(ii) | | Find the PDNF and PCNF of the formula 𝑝∨[¬𝑝→{𝑞∨(¬𝑞→𝑟)}]. | |
| **UNIT-II (Short Answer Questions. Each 2 Marks)** | | | | |
| Q.No. | Question | |  | |
| 1 | Write the formula for Principle of Inclusion and Exclusion for three sets A, B, C | |
| 2 | Given A = {1, 2} and B = then find i) A × B ii)B × B. | |
| 3 | Let A = {a, b, c, d} and R is a relation on A that has the matrix  write relation R for the matrix MR. | |
| 4 | Let A= {a, b, c} , B = {1, 2, 3} and the relations R = {(a,1), (b,1), (c,2), (c,3)}, S = {(a,1), (a,2), (b,1),(b,2)} from A to B then determine , . | |
| 5 | Define equivalence relation. | |
| 6 | Define Bijective function. | |
| 7 | If f = then show that = = I. | |
| 8 | Define cyclic permutation. | |  | |
| 9 | Define Recursive function. | |
| 10 | Define distributive Lattice. | |

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| **UNIT-II (Long Answer Questions. Each 10 Marks)** | | |
| Q.No. | Question |  |
| 1.(i) | If 𝐴 = {1, 2, 3, 4, 5}, 𝐵 = {2, 4, 6, 8}, 𝐶 = {1, 2, 6},find (𝑖)𝐴 – 𝐵 (𝑖𝑖) 𝐵 − 𝐴  𝑖𝑖𝑖)(𝐴*ꓴ*𝐵) − (𝐴*ꓵ*𝐶) |
| 1. (ii) | Let the permutations of the elements {1, 2, 3, 4, 5} be given by  Find . |
| 2.(i) | A sample of 100 logic chips , 23 have defect D1, 26 have a defect on D2, 30 have defect D3 , 7 have defect on D1 and D2, 8 have defect on D1 and D3, 10 have defect on D2 and D3 and 3 have all the three defects. Find the number of chips having i) At least one defect, ii) No defect? |
| 2.(ii) | Let and then find. |
| 3.(i) | Let𝐴 = {1, 2, 3} and 𝐵 = {1,2,3,4}.The relations R and S from A to B are represented by the following matrices. Determine the relations , 𝑅∪𝑆, 𝑅 ∩ 𝑆and 𝑅 – 𝑆, . |
| 3.(ii) | Let f(x) = x + 2, g(x) = x - 2, h(x) = 3x x ϵ R where R is the set of real numbers for gof, fog, foh, hog, hof. |
| 4.(i) | How many positive integers not exceeding 2000 are divisible by 7 or 11 |
| 4.(ii) | Let 𝑓:𝑅→𝑅, 𝑔:𝑅→𝑅 where 𝑅 is the set of real numbers be given by f(x)=𝑥 + 2, g(x)=𝑥2. Find 𝑓𝑜𝑓, 𝑓𝑜𝑔, 𝑔𝑜𝑓, 𝑔𝑜𝑔. |
| 5.(i) | Let𝐴 = {1, 2, 3, 4, 6, 8, 12} On A, define the partial ordering relation R by 𝑎𝑅𝑏 if and only if 𝑎|𝑏. (i)Draw the Hasse diagram for ii) Write down the relation matrix for 𝑅. |
| 5.(ii) | Let A = B = {a, b, c, d} and 𝑅 = {(a,a), (a,c), (b,c), (c,a), (d,b), (d,d)} and  S = {(a,b), (b,c), (c,a), (c,b), (d,c)} compute MR and MS also Draw the digraphs |