**UNIT-1**

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| 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 quantifiers |
| 7 | Define existential quantifiers |
| 8 | Define PDNF & PCNF. |
| 9 | Write the minterms of p,q,r |
| 10 | Define Demorgan’s laws |

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| Q.No. | Question | Marks |
| 1.(i) | Prove that {𝑝→(𝑞→𝑟)}→{(𝑝→𝑞)→(𝑝→𝑟)}is a tautology | 5M |
| 1.(ii) | Prove that for any three propositions p, q, r  ¬ [𝑝∨ (q∧r)] ↔ [(𝑝˅𝑞) ∧(𝑝˅r) ] is a contradiction. | 5M |
| 2.(i) | Construct the truth table for the compound proposition (𝑝→𝑟)∧[(𝑞∧¬𝑟)→(𝑝∨ 𝑟)]. | 5M |
| 2.(ii) | Define the converse, inverse and contrapositive of the implication and write converse, inverse and contrapositive of the implication  “If today is a holiday, then I will go for a movie”. | 5M |
| 3.(i) | Prove that for any three proposition p, q, r the conditional  {(𝑝→𝑞) ∧(𝑞→𝑟)}.→(𝑝→r) is a tautology. | 5M |
| 3.(ii) | Obtain the PCNF of (¬𝑝→𝑟)∧ (𝑞↔p) and hence find PDNF | 5M |
| 4.(i) | Explain in detail about the logical connectives with examples | 5M |
| 4.(ii) | Prove that (¬ 𝑝↔𝑞) ⇔ (𝑝∨ 𝑞) ∧ ¬ (𝑝∧𝑞). | 5M |
| 5.(i) | Prove that for any three propositions p, q, r  [𝑝∨ (q˅r)] ∧¬ 𝑞 (𝑝˅r) | 5M |
| 5.(ii) | Find the PDNF and PCNF of the formula 𝑝∨[¬𝑝→{𝑞∨(¬𝑞→𝑟)}]. | 5M |
| 6.(i) | Show that 𝑟∧(𝑝∨𝑞)is valid from the premises 𝑝∨ 𝑞,𝑞→𝑟,𝑝→𝑚,¬𝑚 | 5M |
| 6.(ii) | Verify the validity of the following argument.  All men are mortal.  Socrates is a man.  Therefore, Socrates is mortal. | 5M |
| 7.(i) | Show that 𝑆∨𝑅 is tautologically implied by P∨Q , P →R , Q→S. | 5M |
| 7.(ii) | Establish the validity of the following arguments.  All integers are rational number.  Some integers are power of 2.  Therefore, Some Rational numbers are Powers of 2. | 5M |
| 8.(i) | Show that the premises 𝑎→(𝑏→𝑐), 𝑑→(𝑏∧¬𝑐), 𝑎∧𝑑 are inconsistent. | 5M |
| 8.(ii) | Test the validity of the following arguments  Sonia is watching TV .  If Sonia is watching TV, then she is not studying.  If she is not studying, then her father will not buy her scooty.  Therefore, Sonia father will not buy a scooty | 5M |
| 9.(i) | If there was a meeting, then catching the bus was difficult.  If they arrived on time then catching the bus was not difficult.  They arrived on time.  Therefore there was no meeting.  Show that the statements constitute a valid argument5 | 5M |
| 9.(ii) | Symbolize the following argument and check for their validity:  “Every living thing is a Plant or an animal.  David’s dog is a live and it is not plant.  All animals have hearts.  Hence David’s dog has a heart. | 5M |
| 10.(i) | Show that the following premises are inconsistent  If Jack misses many classes because of illness, then he fails high school.  If Jack fails high school, then he is uneducated.  If Jack reads lot of books, then he is not uneducated.  Jack misses many classes because of illness and reads a lot of books. | 5M |
| 10.(ii) | Show that (𝑥)[𝑃(𝑥)→𝑄(𝑥)]∧(∃𝑥)𝑃(𝑥)⇒(∃𝑥)𝑄(𝑥).5 | 5M |

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| 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 formula. |
| 10 | Define distributive Lattice. |

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| Q.No. | Question | Marks |
| 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) | 5M |
| 1. (ii) | Let the permutations of the elements {1, 2, 3, 4, 5} be given by  Find . | 5M |
| 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? | 5M |
| 2.(ii) | Let and then find. | 5M |
| 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, . | 5M |
| 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, gog, fof ,foh, hog, hof and fogoh. | 5M |
| 4.(i) | How many positive integers not exceeding 2000 are divisible by 7 or 11 | 5M |
| 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. | 5M |
| 5.(i) | 5. 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. | 5M |
| 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 | 5M |
| 6.(i) | Define power set. Find the power set of𝐴, where 𝐴 = {1, 2,{1, 2}} | 5M |
| 6.(ii) | Find the domain and co domain of so that it is Bijective. Hence find the inverse of f(x). | 5M |
| 7.(i) | Let A = {1, 2} and B = {3, 4}. Write A × B. How many relations are there from A to B. List them | 5M |
| 7.(ii) | Consider the following recursive function definition:  If y < x, then f(x, y) = 0;  If x ≤ y, then f(x, y) = f(x, y - x) + 2. Find the value of f(5,487) | 5M |
| 8.(i) | Let A = {1, 2, 3, 4, 6} and R be a relation on A defined by 𝑎𝑅𝑏 if and only if 𝑎 is a multiple of 𝑏. Represent the relation R as a matrix and draw its digraph. | 5M |
| 8.(ii) | Define Lattice. Also write the properties of lattices. | 5M |
| 9.(i) | Let 𝑋 = {1, 2, 3, 4, 5, 6, 7} and 𝑅 = {(𝑥, 𝑦) ⁄𝑥 –𝑦 𝑖𝑠𝑑𝑖𝑣𝑖𝑠𝑖𝑏𝑙𝑒𝑏𝑦 3}. Show that R is an equivalence relation. Draw the graph of R. | 5M |
| 9.(ii) | Let A = {1, 2, 3, 4} and let S = {(1,2), (2,3), (3,4)} be a relation on A. Find the transitive closure of S. | 5M |
| 10.(i) | Define compatible relation. Explain maximal compatible blocks with an example. | 5M |
| 10.(ii) | Write the different types of functions Explain with example. | 5M |