Hello

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| --- | --- |
| Q8) | h = “John is healthy”, w = “John is Wealthy”, s=”John is wise”   1. h^w^(!s) 2. h^(!w)^s 3. !(h^w^s) 4. H^(!w)^(!s) 5. (!h)^w^s(!s) |
| Q10) | p = “DATAENDFLAG is off”, q = “ERROR equals 0”, r = “SUM is less than 1000”   1. p^q^s 2. p^(!q) 3. p^(~qV~r) 4. (~p^q)^~r 5. ~pV(q^r) |
| Q13) | ~(p^q)V(qVq)   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **p** | **q** | **p^q** | **pVq** | **~(p^q)** | **~(p^q)V(pVq)** | | 0 | 0 | 0 | 0 | 1 | 1 | | 0 | 1 | 0 | 1 | 1 | 1 | | 1 | 0 | 0 | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | 0 | 1 | |
| Q17) | ~(p^q) and ~p^~q   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **p** | **q** | **~p** | **~q** | **p^q** | **~(p^q)** | **~p^~q** | | 0 | 0 | 1 | 1 | 0 | 1 | 1 | | 0 | 1 | 1 | 0 | 0 | 1 | 0 | | 1 | 0 | 0 | 1 | 0 | 1 | 0 | | 1 | 1 | 0 | 0 | 1 | 0 |  |   The 2 statements aren’t equivalent as they don’t have the same values of true and false |
| Q27) | The unit of 467 is4 or it is 6  Let p = The unit of 467 is4, and q = The unit of 467 is6  According to De Morgans law, ~(pVq) = ~p^~q  Hence, the negation is : The unit of 467 isnot 4 nor 6 |
| Q39) | (num\_orders < 50 and num\_instock > 300) or (50<= num\_orders < 75 and num\_instock>500)  Let p = (num\_orders < 50 and num\_instock > 300), q = (50<= num\_orders < 75 and num\_instock>500)  Negation (Using De Morgan’s Law) = ~p and ~q  Let r = num\_orders < 50, s = num\_instock > 300)  Hence, p = s^r, therefore ~p = ~sV~r (Using De Morgan’s Law)  Let t = (50 <= num\_orders < 75), u = num\_instock>500)  Hence, q = t^u, therefore ~p = ~tV~u (Using De Morgan’s Law)  Therefore, negation of given statement is :  (num\_orders >= 50 or num\_instock <= 300) and (((num\_orders < 50)or(num\_orders >= 75)) or num\_instock <= 500) |
| Q43) | (~pVq)V(p^~q)   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **p** | **q** | **~p** | **~q** | **~pVq** | **P^~q** | **(~pVq)V(p^~q)** | | 0 | 0 | 1 | 1 | 1 | 0 | 1 | | 0 | 1 | 1 | 0 | 1 | 0 | 1 | | 1 | 0 | 0 | 1 | 0 | 1 | 1 | | 1 | 1 | 0 | 0 | 1 | 0 | 1 |   This statement is a tautology |
| Q45) | Let p = Bob is majoring in both Math and Computer Science  q = Ann is Majoring in Math  r = Ann is majoring in both Math and Comp Sci  We get the statement as a) (p^q)^~r and b) (~pV~r)^(q^p)   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **p** | **Q** | **r** | **~p** | **~r** | **(p^q)** | **(~pV~r)** | **(p^q)^~r** | **(~pV~r)^(q^p)** | | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |   The 2 statements are logically equivalent |
| **Pg48** |  |
| Q4) | If you don’t fix my ceiling then I won’t pay rent |
| Q11) | (p → (q → r)) ↔ ((p ^ q) → r)   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **p** | **q** | **r** | **(q → r)** | **(p ^ q)** | **(p → (q → r))** | **((p ^ q) → r)** | **(p → (q → r)) ↔ ((p ^ q) → r)** | | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| Q13) | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | a) p → q ≡ ~pVq   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **p** | **q** | **~p** | **p → q** | **~p V q** | | 0 | 0 | 1 | 1 | 1 | | 0 | 1 | 1 | 1 | 1 | | 1 | 0 | 0 | 0 | 0 | | 1 | 1 | 0 | 1 | 1 | | b) ~(p→q) ≡ p^~q   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | p | q | ~q | p → q | ~(p→q) | p^~q | | 0 | 0 | 1 | 1 | 0 | 0 | | 0 | 1 | 0 | 1 | 0 | 0 | | 1 | 0 | 1 | 0 | 1 | 1 | | 1 | 1 | 0 | 1 | 0 | 0 | | |  |  |   The 2 statements in each part are logically equivalent as they both have the same value |
| Q18 | Let p = “It walks like a duck”  q = “It talks like a duck”  r = “It is a duck”  Statements : (p^q)→r , (~pV~q)Vr , (~pV~q)→~r   |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | p | q | r | ~p | ~q | ~r | (p^q) | (~pV~q) | (p^q)→r | (~pV~q)Vr | (~pV~q)→~r | | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 |   Statements 1 and 2 are logically equivalent |
| Q21 | p → q is false   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | p | q | ~p | p→q | ~p→q | pVq | q→p | | 0 | 0 | 1 | 1 | 0 | 0 | 1 | | 0 | 1 | 1 | 1 | 1 | 1 | 0 | | 1 | 0 | 0 | 0 | 1 | 1 | 1 | | 1 | 1 | 0 | 1 | 1 | 1 | 1 | |
| Q36) | No, because the statement “If you are hired, then you have majored in Maths or Comp Sci, gotten a B or higher Average and taken accounting” is not logically equivalent to “If you have majored in Math or Comp Sci, gotten an average of B or Higher, and taken accounting, then you are hired” |
| Q46) | 1. False 2. True 3. True 4. False 5. True 6. False |
| **PG60** |  |
| Q9) | **Premise Premise Premise Conclusion**   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **p** | **q** | **r** | **~q** | **p^q** | **p^q → r** | **pV~q** | **~q → p** | **~r** | | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 |   The statements are invalid as there is a case where the premise is true but conclusion is false. | |
| Q13) | Modus Tollens :  p → q  ~q  **Premise Premise Conclusion**  ∴ ~p   |  |  |  |  |  | | --- | --- | --- | --- | --- | | p | q | p → q | ~q | ~p | | 0 | 0 | 1 | 1 | 1 | | 0 | 1 | 1 | 0 | 1 | | 1 | 0 | 0 | 1 | 0 | | 1 | 1 | 1 | 0 | 0 |   These statements are valid as the conclusion is true when the premise are true |
| Q23 | Let p = “Oleg is math major”  q = “Oleg is an economics major”  r = “Oleg is required to take Math 362”  pVq, p → r, ∴ qV~r  **Premise Premise Conclusion**   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | p | q | r | ~r | pVq | p → r | qV~r | | 0 | 0 | 0 | 1 | 0 | 1 | 1 | | 0 | 0 | 1 | 0 | 0 | 1 | 0 | | 0 | 1 | 0 | 1 | 1 | 1 | 1 | | 0 | 1 | 1 | 0 | 1 | 1 | 1 | | 1 | 0 | 0 | 1 | 1 | 0 | 1 | | 1 | 0 | 1 | 0 | 1 | 1 | 0 | | 1 | 1 | 0 | 1 | 1 | 0 | 1 | | 1 | 1 | 1 | 0 | 1 | 1 | 1 |   It is invalid because the conclusion is false when premise is true |
| Q29) | Let p = Atleast one of the numbers is divisible by 6  Let q = Product of 2 numbers is divisible by 6  **Premise Premise Conclusion**  P → q, ~p, ∴ q   |  |  |  |  |  | | --- | --- | --- | --- | --- | | p | q | p → q | ~p | q | | 0 | 0 | 1 | 1 | 0 | | 0 | 1 | 1 | 1 | 1 | | 1 | 0 | 0 | 0 | 0 | | 1 | 1 | 1 | 0 | 1 |   It is invalid because the conclusion is false when premise is true |
| Q32) | Let p = “I get a Christmas bonus”  Let q = “I sell my motorcycle”  Let r = “I buy a stereo”  p → q, q → r, ∴(pVq) →r   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | p | q | r | pVq | p→r | q→r | (pVq)→r | | 0 | 0 | 0 | 0 | 1 | 1 | 1 | | 0 | 0 | 1 | 0 | 1 | 1 | 1 | | 0 | 1 | 0 | 1 | 1 | 0 | 0 | | 0 | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | 0 | 0 | 1 | 0 | 1 | 0 | | 1 | 0 | 1 | 1 | 1 | 1 | 1 | | 1 | 1 | 0 | 1 | 0 | 0 | 0 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |   Transitivity |