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***Subject:***

 ***Discrete Structure***

***Class:***

 ***2nd Semester Software Engineering***

***Section:***

 ***B***

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 ***QUESTION NO: 1:-***

 **Which of the following are propositions?**

*(a) is not a proposition. (It is a command, or imperative.)*

*(b) is proposition.*

*(c) is proposition.*

*(d) is not a proposition; it's a question.*

*(e) strictly speaking is a propositional function, but many people would say it is a proposition.*

*(f) is not a proposition, because the result can be either true or false, it depends on the values of a & b.*

***QUESTION NO: 2:-***

**P is “x”<50”; q is “x>40”.**

**Write as simply as you can**

*(a) x ≥ 50*

*(b) x ≤ 40*

*(c) 40 < x < 50*

*(d) x < 50 or x > 40. This is true for all values of x.*

*(e) x ≥ 50 (Note that we don't need to say, in addition, that x > 40; this must be true whenever x ≥ 50.)*

*(f) x ≥ 50 and x ≤ 40. This can never be true, whatever the value of x.*

*So (d) is a*[*tautology*](https://en.wikibooks.org/wiki/Discrete_Mathematics/Logic#Tautology)*( it's always true) and (f) is always false.*

***QUESTION NO: 3:-***

**In each part of this question a proposition p is defined. Which of the statements that follow the definition correspond to the proposition ¬p? (There may be more than one correct answer.)**

**(A)**

 *(a) Everybody dislike Maths.*

**(B)**

 *(a) Neither 2 nor 3 is the answer.*

 *(c) The answer is not 2 and it is not 3.*

**(C)**

 *(c) Someone in my class is short or fat.*

***QUESTION NO: 4:-***

**Construct truth tables for:**

1. **(~p v ~q)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **p** | **q** | **~p** | **~q** | **(~p v ~q)** |
| T | T | F | F | F |
| T | F | F | T | T |
| F | T | T | F | T |
| F | F | T | T | T |

1. **q ^ (~p v q)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **p** | **q** | **~p** | **~p v q** | **q ^ (~p v q)** |
| T | T | F | T | T |
| T | F | F | F | F |
| F | T | T | T | T |
| F | F | T | T | F |

**(C) p ^ (q v r)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **p** | **q** | **r** | **q v r** | **P ^ (q v r)** |
| T | T | T | T | T |
| T | T | F | T | T |
| T | F | T | T | T |
| T | F | F | F | F |
| F | T | T | T | F |
| F | T | F | T | F |
| F | F | T | T | F |
| F | F | F | F | F |

1. **(p ^ q) v r**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **p** | **q** | **r** | **(p ^ q)** | **(p ^ q) v r** |
| T | T | T | T | T |
| T | T | F | T | T |
| T | F | T | F | T |
| T | F | F | F | F |
| F | T | T | F | T |
| F | T | F | F | F |
| F | F | T | F | T |
| F | F | F | F | F |

***QUESTION NO: 5:-***

**Use truth tables to show that:**

~ ((P v ~q) v (r ^ (p v ~q))) ≡~p ^ q

Taking L.H.S ~ ((P v ~q) v (r ^ (p v ~q)))

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| p | q | r | ~p | ~q | (p v ~q) | r^(p v ~q) | (p v ~q)v(r^(p v ~q) | ~((p v ~q)v(r^(p v ~q))) |
| T | T | T | F | F | T | T | T | F |
| T | T | F | F | F | T | F | T | F |
| T | F | T | F | T | T | T | T | F |
| T | F | F | F | T | T | F | T | F |
| F | T | T | T | F | F | F | F | T |
| F | T | F | T | F | F | F | F | T |
| F | F | T | T | T | T | T | T | F |
| F | F | F | T | T | T | F | T | F |

Taking R.H.S (~p ^ q)

|  |  |  |  |
| --- | --- | --- | --- |
| **p** | **q** | **~p** | **~p ^ q** |
| T | T | F | F |
| T | T | F | F |
| T | F | F | F |
| T | F | F | F |
| F | T | T | T |
| F | T | T | T |
| F | F | T | F |
| F | F | T | F |

Hence Proved that L.H.S=R.H.S that is

 ~ ((P v ~q) v (r ^ (p v ~q))) ≡~p ^ q

 Because last column of both tables are equal

***QUESTION NO: 6:-***

**Use the Laws of logical propositions to prove that.**

(z ^ w) v (~z ^ w) v (z ^ ~w) ≡ z v w

*= (z ^ w) v (z^ ~w) v (~z ^ w)* ***Using commutative Law***

*= (z ^ (w v ~w)) v (~z ^ w)* ***Using Distributive Law***

*= (z^ T) v (~z ^ w)* ***Using Complement Law***

*= z v (~z ^ w)* ***Using Identity Law***

*= (z v ~z) ^ (z v w)* ***Using Distributive Law***

*= T ^ (z v w)* ***Using Complement Law***

*= (z v w) ^ T* ***Using Commutative Law***

*= z v w* ***Using Identity Law***