**JAWABAN LATIHAN SOAL PDF PERT 13,14 (LOGIKA MATEMATIKA 2)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No. 1 | | | |  | | |  | | |  | |  | | | | | |  | | | |  | |  |  | |  |  |  | | |
| Tentukan dari pernyataan manjemuk ini manakah yang merupakan tautologi! | | | | | | | | | | | | | | | | | | | | | | | | |  | |  |  |  | | |
| **a. [~ (p V ~q) V (~p ^ ~q)] <-> ~p** | | | | | | | | |  | | | | |  | | | | | | | |  |  | |  | |  |  |  | | |
| Breakdown : | | | |  | | |  |  |  | | | | |  | | | | | | | |  |  | |  | |  |  |  | | |
| 1. (p V ~q), ~ (p V ~q) | | | | |  | | | |  | | | | |  | | | | | | | |  |  | |  | |  |  |  | | |
| 2. (~p ^ ~q) | | | | |  | | | |  | | | | |  | | | | | | | |  |  | |  | |  |  |  | | |
| 3. [~ (p V ~q) V (~p ^ q)] | | | | |  | | | |  | | | | |  | | | | | | | |  |  | |  | |  |  |  | | |
| 4. [~ (p V ~q) V (~p ^ q)] <-> ~p | | | | |  | | | |  | | | | |  | | | | | | | |  |  | |  | |  |  |  | | |
|  |  |  | | |  | | | |  | | | | |  | | | | | | | | |  | |  | |  |  |  | | |
| p | q | ~p | | | ~q | | | | (p V ~q) | | | | | ~ (p V ~q) | | | | | | (~p ^ ~q) | | | [~ (p V ~q) V (~p ^ ~q)] | | | | [~ (p V ~q) V (~p ^ ~q)] <-> ~p | | | | |
| B | B | **S** | | | **S** | | | | **B** | | | | | **S** | | | | | | **S** | | | **S** | | | | **B** | | | | |
| B | S | **S** | | | **B** | | | | **B** | | | | | **S** | | | | | | **S** | | | **S** | | | | **B** | | | | |
| S | B | **B** | | | **S** | | | | **S** | | | | | **B** | | | | | | **S** | | | **B** | | | | **B** | | | | |
| S | S | **B** | | | **B** | | | | **B** | | | | | **S** | | | | | | **B** | | | **B** | | | | **B** | | | | |
|  |  |  | | |  | | | |  | | | | |  | | | | | |  | | |  | | | |  |  |  | | |
| **Jawaban : [~ (p V ~q) V (~p ^ q)] <-> ~p merupakan tautologi karena semua pernyataan bernilai benar** | | | | | | | | | | | | | | | | | | | | | | | | | | |  |  |  | | |
| **b. (q->r) -> [(p V q) -> (p V r)]** | | | | | | | |  | | | | |  | | | | |  | |  | | |  | | | | |
| Breakdown : | | | | | | | | | |  | |  | |  | |  | |  | |  | | |  | | | | | | |  |
| 1. (q->r) | | | | | | | |  | | | | |  | | | | |  | |  | | |  | | | | | | |  |
| 2. (p V q ), (p V r) | | | | | | | |  | | | | |  | | | | |  | |  | | |  | | | | | | |  |
| 3. [(p V q) -> (p V r)] | | | | | | | |  | | | | |  | | | | |  | |  | | |  | | | | | | |  |
| 4. (q->r) -> [(p V q) -> (p V r)] | | | | | | | |  | | | | |  | | | | |  | |  | | |  | | | | | | |  |
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|  | | |  | | |  | |  | | | | |  | | | | |  | |  | | |  | | | | | | |  |
| p | | | q | | | r | | q->r | | | | | (p V q ) | | | | | (p V r) | | [(p V q) -> (p V r)] | | | (q->r) -> [(p V q) -> (p V r)] | | | |
| B | | | B | | | B | | **B** | | | | | **B** | | | | | **B** | | **B** | | | **B** | | | |
| B | | | B | | | S | | **S** | | | | | **B** | | | | | **B** | | **B** | | | **B** | | | |
| B | | | S | | | B | | **B** | | | | | **B** | | | | | **B** | | **B** | | | **B** | | | |
| B | | | S | | | S | | **B** | | | | | **B** | | | | | **B** | | **B** | | | **B** | | | |
| S | | | B | | | B | | **B** | | | | | **B** | | | | | **B** | | **B** | | | **B** | | | |
| S | | | B | | | S | | **S** | | | | | **B** | | | | | **S** | | **S** | | | **B** | | | |
| S | | | S | | | B | | **B** | | | | | **S** | | | | | **B** | | **B** | | | **B** | | | |
| S | | | S | | | S | | **B** | | | | | **S** | | | | | **S** | | **B** | | | **B** | | | |
|  | | |  | | |  | |  | | | | |  | | | | |  | |  | | |  | | | | | | |  |
| **Jawaban : (q->r) -> [(p V q) -> (p V r)] merupakan tautologi karena semua penyatannya bernilai benar** | | | | | | | | | | | | | | | | | | | | | | | | | | | |

2. Periksalah kesahihan setiap argumen berikut!

a. p -> q

~p

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∴ ~ q -> **modus tollens**

Jawab :

**[(p -> q) ^ ~p) -> ~q**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No. 2 | Tabel Kebenaran | | |  |  |  |  |  |
| **a. [(p -> q) ^ ~p)] -> ~q** | | | |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| p | q | ~p | ~q | (p --> q) | [(p -> q) ^ ~p)] | [(p -> q) ^ ~p)] -> ~q | |  |
| B | B | **S** | **S** | **B** | **S** | **B** | |  |
| B | S | **S** | **B** | **S** | **S** | **B** | |  |
| S | B | **B** | **S** | **B** | **B** | **S** | |  |
| S | S | **B** | **B** | **B** | **B** | **B** | |  |
|  |  |  |  |  |  |  |  |  |
| **Berdasarkan tabel di atas, [(p -> q) ^ ~p)] -> ~q bukan merupakan tautologi, maka argumen tidak sahih** | | | | | | | | |

b. ~p -> q

~q

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∴ p -> **modus pones**

Jawab :

**[(~p -> q) ^ ~q] -> p**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **b. [(~p -> q) ^ ~q) -> p** | | | |  |  |  |  |
|  |  |  |  |  |  |  |  |
| p | q | ~p | ~q | (~p->q) | [(~p -> q) ^ ~q) | [(~p -> q) ^ ~q) -> p | |
| B | B | **S** | **S** | **B** | **S** | **B** | |
| B | S | **S** | **B** | **B** | **B** | **B** | |
| S | B | **B** | **S** | **B** | **S** | **B** | |
| S | S | **B** | **B** | **S** | **S** | **B** | |
|  |  |  |  |  |  |  |  |
| **Berdasarkan tabel di atas, [(~p -> q) ^ ~q)] -> p merupakan tautologi, maka argumen sahih** | | | | | | | |

c. ~q -> p kontaposisinya p -> ~q

q V ~p kontraposisinya -> p

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∴ q

Jawab :

**[(~q->p) ^ (q V ~p)] -> q**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **c. [(~q->p) ^ (q V ~p)] -> q** | | | |  |  |  |  |  |  |
| p | q | ~p | ~q | (~q->p) | (q V ~p) | [(~q->p) ^ (q V ~p)] | | [(~q->p) ^ (q V ~p)] -> q | |
| B | B | **S** | **S** | **B** | **B** | **B** | | B | |
| B | S | **S** | **B** | **B** | **S** | **S** | | B | |
| S | B | **B** | **S** | **B** | **B** | **B** | | B | |
| S | S | **B** | **B** | **S** | **B** | **S** | | B | |
|  |  |  |  |  |  |  | |  |  |
| **Berdasarkan tabel di atas, [(~p -> q) ^ ~q)] -> p merupakan tautologi, maka argumen sahih** | | | | | | | | |  |

3. Premis 1 : Jika suatu bilangan habis dibagi 6, maka bilangan itu habis dibagi 3.

Premis 2 : 60 habis dibagi 6

Kesimpulan : 60 habis dibagi 3

Apakah penarikan kesimpulan diatas sahih?

Jawab:

p : 60 habis dibagi 6

q : 60 habis dibagi 3

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p -> q

p

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* q

Pernyataan majemuk dari argumen : [(p->q) ^ p] -> q

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No. 3 | Tabel Kebenaran | | |  |  |  |  |  |
| **[(p->q) ^ p] -> q** | | | | |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| p | q | ~p | ~q | (p --> q) | [(p -> q) ^ p)] | [(p -> q) ^ p)] -> q | |  |
| B | B | **S** | **S** | **B** | **B** | **B** | |  |
| B | S | **S** | **B** | **S** | **S** | **B** | |  |
| S | B | **B** | **S** | **B** | **S** | **B** | |  |
| S | S | **B** | **B** | **B** | **S** | **B** | |  |
|  |  |  |  |  |  |  |  |  |
| **Berdasarkan tabel di atas, [(p->q) ^ p] -> q tautologi, maka penarikan kesimpulan yang diambil sahih** | | | | | | | | |

4. Tentukan ingkaran dari setiap pernyataan berkuantor

Penyataan Berkuantor

**-Kuantor Universal (∀)** : menunjukkan bahwa setiap objek dalam semestanya mempunyai sifat kalimat yang menyatakannya **(semua atau setiap)**

**-Kuantor Ekstensial (∃)** : menunjukkan bahwa setiap objek dalam semestanya mempunyai sifat kalimat menyatakannya **(beberapa, sebagian, ada, atau sekurang-kurangnya)**

a. **Semua** tamu **boleh** menyalami pengantin. -> kuantor universal

-> Kalimat ingkaran : **Ada** tamu **tidak boleh** menyalami pengantin.

b. **Beberapa** bilangan real adalah rasional dan irasional. -> kuantor ekstensial

-> Kalimat ingkaran : **Semua** bilangan real adalah **bukan** rasional dan irasional.

c. **Ada** murid mengatakan belajar itu membosankan. -> kuantor ekstensial

Kalimat ingkaran : **Semua** murid mengatakan belajar itu **tidak** membosankan.

d. **Beberapa** fungsi kuadrat **tidak** memotong sumbu –x. -> kuantor ekstensial

Kalimat ingkaran : **Semua** fungsi kuadrat **memotong** sumbu –x.

5. Tentukanlah konklusinya!

a. Jika Aron dermawan, maka ia disenangi masyarakat. Namun sayangnya, ia bukanlah seorang yang dermawan

Diketahui :

p : Aron dermawan

q: Aron disenangi masyarakat

Maka:

P1 : p -> q

P2 : ~p

**∴ tidak dapat diambil kesimpulan**

b. Jika servis hotel baik, maka hotel itu kedatangan banyak tamu. Hotel itu akan mendapatkan untung besar jika kedatangan banyak tamu

Diketahui:

p : Servis hotel baik

q : Hotel kedatangan banyak tamu

r : Hotel mendapatkan untung besar

Maka :

P1 : p -> q

P2 : r -> q // konversnya q->r

P1 : p -> q

P2 : q -> r

**∴ p -> r (Jika servis hotel baik, maka hotel akan mendapatkan untung besar)**

c. Jika lulus Ujian Nasional dan tidak lulus SBMPTN, maka Prisma bekerja di perusahaan swasta. Kenyataannya, Prisma tidak berkerja di perusahaan swasta.

Diketahui :

p : Lulus Ujian Nasional

q : Lulus SBMPTN

r : Bekerja di perusahaan swasta

Maka :

P1 : (p ^ ~q) -> r //

P2 : ~r

∴ **(p ^ ~q) (Prisma lulus Ujian Nasional dan tidak lulus SBMPTN)**

d. Jika penguasaan matematika rendah, maka sulit untuk menguasai Logika Matematika. Logika Matematika tidak sulit dikuasai **atau** penalaran logis tidak berkembang. Jika penalaran logis tidak berkembang, maka negara akan semakin tertinggal.

Diketahui :

p : Penguasaan Matematika Rendah

q : Sulit Penguasaan Logika Matematika

r : Penalaran Logis Tidak Berkembang

s : Negara semakin tertinggal

Maka :

P1 : p -> q

P2 : ~q -> r ≡ q = r

P3 : r -> s

Kesimpulan dari P1 & P2

P1 : p -> q

P2 : q -> r

∴ p -> r ... (P4)

Kesimpulan dari P4 & P3

P4 : p -> r

P3 : r -> s

∴ p -> s

**Maka konklusi akhirnya adalah Jika penguasaan matematika rendah, maka negara akan semakin tertinggal.**