MATHEMATICAL REASONING -PYQ

1. The statement $p \to (q \to p)$ is equivalent :-

[AIEEE-2008]

(1) $p \to (p \to q)$ (2) $p \to (p \vee q)$
(3) $p \to (p \wedge q)$ (4) $p \to (p \leftrightarrow q)$

2. Let p be the statement "x is an irrational number", q be the statement "y is a trascendental number", and r be the statement "x is a rational number iff y is a transcendental number". **[AIEEE-2008]**

Statement –1 : r is equivalent to either q or p.

Statement –2 : r is equivalent to $\sim (p \leftrightarrow \sim q)$

(1) Statement –1 is false, Statement –2 is true

(2) Statement–1 is true, Statement–2 is false

(3) Statement–1 is true, Statement–2 is true; Statement–2 is a correct explanation for Statement–1

(4) Statement–1 is true, Statement–2 is true; Statement–2 is not a correct explanation for Statement–1

3. **Statement–1 :** $\sim(p \leftrightarrow \sim q)$ is equivalent to $p \leftrightarrow q$.

Statement–2 : $\sim(p \leftrightarrow \sim q)$ is a tautology.

[AIEEE-2009]

(1) Statement–1 is true, Statement–2 is false.

(2) Statement–1 is false, Statement–2 is true.

(3) Statement–1 is true, Statement–2 is true ; Statement–2 is a correct explanation for Statement–1.

(4) Statement–1 is true, Statement–2 is true ; Statement–2 is not a correct explanation for statement–1.

4. Let S be a non-empty subset of R.

Consider the following statement :

p : There is a rational number $x \in S$ such that $x > 0$

which of the following statements is the negation of the statement p ? **[AIEEE-2010]**

(1) There is a rational number $x \in S$ such that $x \leq 0$

(2) There is no rational number $x \in S$ such that $x \leq 0$

(3) Every rational number $x \in S$ satisfies $x \leq 0$

(4) $x \in S$ and $x \leq 0 \Rightarrow x$ is not rational

5. Consider the following statements :-

P : Suman is brilliant.

Q : Suman is rich.

R : Suman is honest.

The negation of the statement,

"Suman is brilliant and dishonest if and only if Suman is rich" can be equivalently expressed as:

[AIEEE-2011,Main 2015(Online)]

(1) $\sim Q \leftrightarrow \sim P \vee R$ (2) $\sim Q \leftrightarrow \sim P \wedge R$
(3) $\sim Q \leftrightarrow P \wedge \sim R$ (4) $\sim Q \leftrightarrow P \vee \sim R$

6. The only statement among the followings that is a tautology is : **[AIEEE-2011]**

(1) $q \to [p \wedge (p \to q)]$

(2) $p \wedge (p \vee q)$

(3) $p \vee (p \wedge q)$

(4) $[p \wedge (p \to q)] \to q$

7. The negation of the statement :- **[AIEEE-2012]**

"If I become a teacher, then I will open a school", is :

(1) I will not become a teacher or I will open a school.

(2) I will become a teacher and I will not open a school.

(3) Either I will not become a teacher or I will not open a school.

(4) Neither I will become a teacher nor I will open a school.

8. Let p and q denote the following statements

p : the sun is shining

q : I shall play tennis in the afternoon.

The negation of the statement "If the sun is shining then I shall play tennis in the afternoon", is :

[AIEEE-2012 (Online)]

(1) $\sim q \Rightarrow \sim p$ (2) $p \wedge \sim q$
(3) $q \wedge \sim p$ (4) $q \Rightarrow \sim p$

9. The statement that is TRUE among the following is :-　　　　　　**[AIEEE-2012 (Online)]**

(1) The contrapositive of $3x + 2 = 8 \Rightarrow x = 2$ is $x \neq 2 \Rightarrow 3x + 2 \neq 8$.

(2) $p \vee q$ and $p \wedge q$ have the same truth value

(3) The converse of $\tan x = 0 \Rightarrow x = 0$ is $x \neq 0 \Rightarrow \tan x = 0$

(4) $p \Rightarrow q$ is equivalent to $p \wedge \sim q$

10. Let p and q be two statements. Amongst the following, the statement that is equivalent to $p \rightarrow q$ is :-　　　**[AIEEE-2012 (Online)]**

(1) $p \wedge \sim q$　　　　　　(2) $\sim p \vee q$

(3) $\sim p \wedge q$　　　　　　(4) $p \vee \sim q$

11. The logically equivalent proposition of $p \Leftrightarrow q$ is :-
　　　　　　　　　　　　[AIEEE-2012 (Online)]

(1) $(p \wedge q) \Rightarrow (q \vee p)$

(2) $p \wedge q$

(3) $(p \wedge q) \vee (q \Rightarrow p)$

(4) $(p \Rightarrow q) \wedge (q \Rightarrow p)$

12. Consider :

Statement-I : $(p \wedge \sim q) \wedge (\sim p \wedge q)$ is a fallacy.

Statement-II : $(p \rightarrow q) \leftrightarrow (\sim q \rightarrow \sim p)$ is a tuatology.
　　　　　　　　　　　　[JEE (Main)-2013]

(1) Statement-I is true, Statement-II is true; statement II is a **correct** explanation for Statement-I.

(2) Statement-I is true, Statement-II is true; statement-II is **not** a correct explanation for Statement-I.

(3) Statement-I is true, Statement-II is false.

(4) Statement-I is false, Statement-II is true.

13. The statement $\sim(p \leftrightarrow \sim q)$ is :　**[JEE (Main)-2014]**

(1) equivalent to $p \leftrightarrow q$

(2) equivalent to $\sim p \leftrightarrow q$

(3) a tautology

(4) a fallacy

14. The proposition $\sim(p \vee \sim q) \vee \sim(p \vee q)$ is logically equivalent to :-　　**[JEE(Main)-2014 (Online)]**

(1) $\sim p$　　(2) $\sim q$　　(3) p　　(4) q

15. Let p, q, r denote arbitrary statements. Then the logically equivalent of the statement $p \Rightarrow (q \vee r)$ is:-

　　　　　　　　　　　　[JEE(Main)-2014 (Online)]

(1) $(p \vee q) \Rightarrow r$

(2) $(p \Rightarrow \sim q) \wedge (p \Rightarrow r)$

(3) $(p \Rightarrow q) \wedge (p \Rightarrow \sim r)$

(4) $(p \Rightarrow q) \vee (p \Rightarrow r)$

16. The contrapositive of the statement "If it is raining, then I will not come", is :

　　　　　　　　　　　　[JEE(Main)-2015 (Online)]

(1) If I will not come, then it is raining.

(2) If I will not come, then it is not raining.

(3) If I will come, then it is not raining.

(4) If I will come, then it is raining.

17. The negation of $\sim s \vee (\sim r \wedge s)$ is equivalent to :　　　　　　**[JEE(Main)-2015]**

(1) $s \vee (r \vee \sim s)$　　　　(2) $s \wedge r$

(3) $s \wedge \sim r$　　　　　　(4) $s \wedge (r \wedge \sim s)$

18. The Boolean Expression $(p \wedge \sim q) \vee q \vee (\sim p \wedge q)$ is equivalent to :-　　**[JEE(Main)-2016]**

(1) $p \vee \sim q$　(2) $\sim p \wedge q$　(3) $p \wedge q$　(4) $p \vee q$

19. Consider the following two statements :

P: If 7 is an odd number, then 7 is divisible by 2.

Q: If 7 is a prime number, then 7 is an odd number

If V_1 is the truth value of the contrapositive of P and V_2 is the truth value of contrapositive of Q, then the ordered pair (V_1, V_2) equals :

　　　　　　　　　　　　[JEE(Main)-2016 (Online)]

(1) (F, F)　　　　　　(2) (T, T)

(3) (F, T)　　　　　　(4) (T, F)

20. The contrapositive of the following statement,

"If the side of a square doubles, then its area increases four times", is: **[JEE(Main)-2016 (Online)]**

(1) If the side of a square is not doubled, then its area does not increase four times.

(2) If the area of a square does not increase four times, then its side is not doubled.

(3) If the area of a square increases four times, then its side is not doubled.

(4) If the area of a square increases four times, then its side is doubled.

21. The Boolean expression $\sim (p \vee q) \vee (\sim p \wedge q)$ is equivalent to : **[JEE(Main)-2018]**

(1) p   (2) q   (3) $\sim$q   (4) $\sim$p

22. If $p \rightarrow (\sim p \vee \sim q)$ is false, then the truth values of p and q are respectively :

[JEE(Main)-2018 (Online)]

(1) F, F   (2) F, T   (3) T, T   (4) T, F

23. If $(P \wedge \sim q) \wedge (p \wedge r) \rightarrow \sim p \vee q$ is false, then the truth values of p,q and r are respectively

[JEE(Main)-2018 (Online)]

(1) T,T,T   (2) F,F,F

(3) T,F,T   (4) F,T,F

Previous Years Questions				ANSWER KEY					Exercise-II
Que.	1	2	3	4	5	6	7	8	9	10
Ans.	2	2	1	3	3	4	2	2	1	2
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	4	2	1	1	4	3	2	4	3	2
Que.	21	22	23							
Ans.	4	3	3							