Mental Ability

Ganit Bodh Series

Self Evaluation Test -22 (Mathematical Reasoning)

1. Which of the following is different from others?
   a) $p \to q$ b) $\sim p \vee q$
   c) $\sim q \to \sim p$ d) $p \vee \sim q$.
2. If each of the following statements $p \to q$, $p \vee \sim r$, r is true then
   a) p is false b) q is false
   c) q is true d) none of these
3. Which of the following is different from others?
   a) $\sim (p \leftrightarrow q)$ b) $p \leftrightarrow \sim q$
   c) $\sim p \leftrightarrow q$ d) $p \leftrightarrow q$
4. If both p and q are true then $p \underline{\vee} q$ is
   a) false b) true
   c) may be true or may be false
   d) none of these
5. Inverse of the proposition $p \leftrightarrow q$ is equivalent to
   a) $p \to q$ b) $q \to p$
   c) $p \leftrightarrow q$ d) none of these
6. Which of the following is not true?
   a) $p \vee p = p$ b) $p \wedge p = p$
   c) $p \wedge t = p$ d) $p \wedge t = t$
7. If a and b are any two elements of a Boolean lattice, then $(a + b)' \bullet (a \bullet b)'$ is equal to
   a) $a \bullet b$ b) $a' \bullet b'$
   c) $a \bullet b'$ d) $a' \bullet b$.
8. The remainder when 3^{500} is divided by 13 is
   a) 1 b) 7
   c) 3 d) 9
9. The last (units) digit in 11^{10^6} is
   a) 6 b) 3
   c) 7 d) 1
10. The remainder when $(111)^{78}$ is
    a) 78 b) 110
    c) 1 d) none of these
11. The index of the highest power of 7 that divides $\lfloor\underline{350}$ is
    a) 58 b) 50
    c) 57 d) none of these
12. The false statement in the following is
    a) $p \wedge (\sim p)$ is a contradiction
    b) $(p \to q) \leftrightarrow (\sim q \to \sim p)$ is contradiction
    c) $\sim (\sim p) \leftrightarrow p$ is a tautology
    d) $p \vee (\sim p)$ is a tautology
13. If $p \to (\sim p \vee q)$ is false, the truth value of p and q are respectively
    a) F, T b) F, F
    c) T, T d) T, F
14. $\sim p \wedge q$ is logically equivalent to
    a) $p \to q$ b) $q \to p$
    c) $\sim (p \to q)$ d) $\sim (q \to p)$
15. Which of the following is the inverse of the proposition. "If a number is prime then it is odd"?
    a) If a number is not prime then it is odd.
    b) If a number is not prime then it is not odd.
    c) If a number is not odd then it is not prime?
    d) If a number is odd then it is prime.
16. Let P : "A can't excel in studies in less his father helps him" ; Q : "A is good in studies when his father helps him", then "A can't excel in studies if his father helps him", will be
    a) $P \wedge Q$ b) $Q \to P$
    c) $P \to Q$ d) $P \leftrightarrow Q$.
17. If $(p \wedge \sim r) \to (\sim p \vee q)$ is false, then the truth values of p, q and r are respectively
    a) T, F and F b) F,F and T
    c) F, T and T d) T, F and T
18. If p : 4 is an even prime number,
    q : 6 is a divisor of 12
    and r : HCF of 4 and 6 is 2
    then which one of the following is true?
    a) $p \wedge q$ b) $(p \vee q) \wedge (\sim r)$
    c) $p \leftrightarrow (q \wedge r)$. d) $\sim p \vee (q \wedge r)$
    e) $p \leftrightarrow (q \wedge r)$.

    Each paragraph given below is followed by some multiple choice questions. Each question hs one correct option. Chose the correct option.

    Paragraph 1. Consider the statement
    $r : p \to (\sim p \vee q)$
    where p and q are any two logical statements.
19. If the truth values of p and q are respectively F and T, then what is the truth value of r
    a) T b) F
    c) T or F d) none of these
20. If r is given to have truth value F, then the truth values of p and q are respectively
    a) T, T b) F, F
    c) F, T d) T, f.
21. Contrapositive of the statement r is
    a) $(\sim p \vee q) \to p$ b) $(p \wedge \sim q) \to (\sim p)$
    c) $p \wedge \sim q$ d) none of these

    Consider the natural number n = 720
22. The number of divisors of n is
    a) 6 b) 24
    c) 30 d) none of these
23. Sum of divisors of n is
    a) 60 b) 2418
    c) 30 d) none of these
24. The number of positive integers less than n and relatively prime to n is
    a) 30 b) 2418
    c) 60 d) 192

Each of the following questions contain two statements:
Statement-1 (Assertion) and Statement-2 (Reason).
Each of these questions also has four alternative choices, only one of which is correct. Select the correct choice.

25. Statement-1 : "$(p \wedge \sim q) \wedge (\sim p \wedge q)$ is a fallacy."

    Statement-2 "$(p \rightarrow q) \longleftrightarrow (\sim q \rightarrow \sim p)$" is a tautology.

    a) Statement-1 is true, statement-2 is true
    b) Statement-1 is true, statement-2 is false
    c) Statement-1 is false, statement-2 is true
    d) Statement-1 is true, statement-2 is true; statement-2 is a correct explanation for statement-1.

26. Statement-1: "The number of positive integers less than 72 and relatively prime to 72 is 24"
    Statement-2 : "The number of positive divisors of 72 is 12."

    a) Statement-1 is true, statement-2 is true; statement-2 is a correct explanation for statement-1.
    b) Statement-1 is true, statement-2 is true; statement-2 is not a correct explanation for statement-1.
    c) Statement-1 is true, statement-2 is false.
    d) Statement-1 is false, statement-2 is true

27. Let $n = p_1^{\alpha_1} p_2^{\alpha_2} p_3^{\alpha_3} \ldots\ldots p_k^{\alpha_k}$ be a natural number, where $p_1, p_2, \ldots\ldots p_k$ are distinct primes and α_i's are positive integers.

    Statement-1: "The number of positive divisors of n is $(\alpha_1+1)(\alpha_2+1)(\alpha_3+1)\ldots(\alpha_k+1)$".

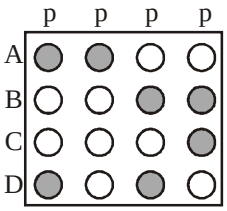
    Statement-2: The number of ways of choosing none, one, two....or more objects from amongst α_1 object of one kind, α_2 objects of another kind, α_3 objects yet of another kind, ..., α_k objects again of same kind, is $(\alpha_1+1)(\alpha_2+1)\ldots(\alpha_k+1)$

    a) Statement-1 is true, statement-2 is true but statement-2 is not a correct explanation for statement-1.
    b) statement-1 is true, statement-2 is true; statement-2 is a correct explanation for statement-1.
    c) Statement-1 is true, statement-2 is false.
    d) Statement-1 is false, statement-2 is true.

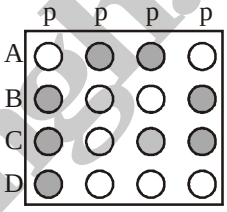
Directions:

Each questions in this section contains statements in two columns, which have to be matched. Statements in Column I are labelled as (A, (B), (C) and (D) whereas statements in column II are either labelled as (p), (q), (r), (s) or as (p), (q), (r), (s), (t). the answers to these questions have to be indicated by darkening of appropriate bubbles as illustrated in the following examples:

If the correct matches are A - pq, B - rs, C - s, D - pr, then the correct darkening of bubbles will look like the following:



If the correct matches are A-qr, B-pt, C-pst and D-p, then correct darkening of bubbles will look like the following:



28.

	Column I		Column II
A	$\sim(p \wedge q)$	p)	$\sim p \leftrightarrow q$
B	$q \rightarrow \sim p$	q)	$p \leftrightarrow \sim q$
C	$\sim(p \leftrightarrow q)$	r)	$\sim p \leftrightarrow \sim q$
D	$\sim\{(p \rightarrow q) \wedge (q \rightarrow p)\}$	s)	$\sim p \vee \sim q$

29.

	Column I		Column II
A	$(p \vee q) \vee (q \vee \sim q)$	p)	is a fallacy
B	$(p \wedge q) \wedge (p \wedge \sim p)$	q)	is a contradiction
C	$(p \rightarrow q) \wedge (q \rightarrow p)$	r)	is a tautology
D	$(p \rightarrow q) \leftrightarrow (\sim q \rightarrow \sim p)$	s)	is neither a fallacy nor a tautology

30.

	Column I		Column II
A	Number of divisors of 420 is	p)	60
B	Number of even divisors of 720 is	q)	30
C	Sum of divisors of 24 is	r)	120
D	Number of divisors of $2^4 \times 3^3 \times 7^2$ is	s)	24