ONE TWO ACADEMY

Unit Test - 12

TOTAL:- 45 **GENERAL MATHEMATICS** **STD XII**

Discrete Mathematics

Choose the correct answer:- ***5 x 1 = 5***

1)The number of rows in the truth table of ~[p^(~q)] is ……..

(a) 2 (b) 4 (c) 6 (d) 8

2)Which of the following is a tautology?

(a) p v q (b) p ^ q (c) p v ~p (d) p ^ ~ p

3. The value of $[3] +_{11} ([5] +_{11} + [6])$ is

(a) [0] (b) [1] (c) [2] (d) [3]

4. A binary operation on a set S is a function from

(a) S—-> S (b) (SXS) —-> S (c) S—->(SXS) (d) SXS —-> SXS

5)If a compound statement is made up of three simple statements, then the number of rows in the truth table is ……

(a) 8 (b) 6 (c) 4 (d) 2

Answer any 4 of the following (Question no 8 is compulsory):- ***5 x 2 = 10***

6)Let A = $\begin{pmatrix} 0 & 1 \\ 1 & 1 \end{pmatrix}$ and B = $\begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}$ be any two boolean matrices of the same type.

Find A v B and A ^ B.

7) Let * be defined on **R** by (a*b) = a + b + ab - 7. Is * binary on R? If so, then find $3*(\frac{-7}{15})$.

8)Subtraction (-) is not binary on **N. Justify**

9)State and prove the uniqueness of identity.

10) State and prove the involution law.

11) Find dual for (p v q) ^ (r ^ s) v F.

Answer any 4 of the following (Question no 21 is compulsory):- ***7 x 3 = 21***

12) Write the converse, inverse and contrapositive of each of the following implications.

" If a quadrilateral is a square then it is a rectangle"

13)Construct a truth table for ~ p ^ ~ q.

14)Show that p —> q and q—-> p are not equivalent.

15) Check whether the statement p —> (q—>p) is a tautology or a contradiction without using truth table.

16)Write each of the following sentences in symbolic form using statement variables p and q .

(i) 19 is not a prime number and all the angles of a triangle are equal.

(ii) 19 is a prime number or all the angles of a triangle are not equal

(iii) 19 is a prime number and all the angles of a triangle are equal (iv) 19 is not a prime number

17)Verify (i) closure property (ii) commutative property, and (iii) associative property of the following operation on the given set. $(a*b) = a^b$; for all a, b ∈ **N** (exponentiation property)

Answer the following:- **4 x 5 = 20**

18)Prove that p—> (~q v r) ≡ ~ p v (~ q v r) using truth table.

OR

Prove that p—> (q—>r) ≡ (p^q) —> r without using the truth table.

19)Let A be **Q** \ **{1}** . Defined * on A by x*y = x + y - xy. Is binary on A? If so examine all the properties.

OR

Verify (i) closure property, (ii) commutative property, (iii) associative property,
(iv) existence of identity, and (v) existence of inverse for the operation +5 on Z_5 using table corresponding to addition modulo 5.

20)Construct the truth table for $(p \bar{\vee} q) \wedge (p \bar{\vee} \neg q)$

OR

State and prove De-Morgan's law by using truth table.

21)State and prove the uniqueness of inverses.

OR

(i) Let $M = \left\{ \begin{pmatrix} x & x \\ x & x \end{pmatrix} : x \in R - \{0\} \right\}$ and let $*$ be the matrix multiplication. Determine whether M is closed under $*$. If so, examine the commutative and associative properties satisfied by $*$ on M.

(ii) Let $M = \left\{ \begin{pmatrix} x & x \\ x & x \end{pmatrix} : x \in R - \{0\} \right\}$ and let $*$ be the matrix multiplication. Determine whether M is closed under $*$. If so, examine the existence of identity, existence of inverse properties for the operation $*$ on M.

All the best