**Second Semester B.Voc. Degree Examination, May/June 2018**
**(CBCS) (F+R) (2016-17 and Onwards)**
**INFORMATION TECHNOLOGY**
**201 : Discrete Mathematical Structures**

Time : 3 Hours

Max. Marks : 70

**Instructions :** *Answer all Sections.*

### SECTION – A

(10×2=20)

Answer **any ten** of the following :

1. Write the power set of $A = \{1, 2, 3\}$.

2. If $A = \{2, 3, 4, 8\}$, $B = \{1, 3, 4\}$ and $U = \{0, 1, 2, 3, 4, 5, 6, 7, 8\}$ verify
   $A - B = A \cap \bar{B}$.

3. Define Tautology.

4. Construct the truth table for $\sim (p \rightarrow q)$.

5. Define homomorphism.

6. Write the following sets in tabular form :

   i) $A = \{X : X \text{ is a divisor of } 24\}$

   ii) $B = \{X : X \text{ is a multiple of 3 or 5}\}$.

7. What is logical equivalence ?

8. Let $f : A \rightarrow B$, $g : B \rightarrow C$ defined by $f(a) = a - 1$, $g(b) = b^2$. Find fog (2).

9. Give an example of a relation which is reflexive, symmetric but not transitive.

10. On the set of integers Z, $a * b = ab + 1$, $\forall\ a, b \in Z$. Verify whether $*$ is associative or not.

P.T.O.

11. If G = {3, 4}  H = {2, 5, 6}. Find G × H and H × G.

12. Define a group.

## SECTION – B

Answer **any five** questions :                          (5×10=50)

13. a) If A = {a, b, c, d}, B = {c, d} and C = {d, e} find A – B, (A – B) ∩ (B – C), B × C.      5

    b) Prove that $(p \wedge q) \wedge \sim (p \vee q)$ is a contradiction.      5

14. a) If $f : R \to R$ is defined by $f(x) = 2x + 5$, prove that f is one-one and onto.      5

    b) Prove by induction that $1^2 + 2^2 + 3^2 + \ldots + n^2 = \dfrac{n(n+1)(2n+1)}{6}$, $\forall n \in N$.      5

15. a) Verify whether $\sim (p \leftrightarrow q) \equiv \sim [(p \to q) \wedge (q \to p)]$.      5

    b) Prove by mathematical induction, $1.2 + 3.4 + 5.6 + \ldots + (2n - 1)(2n) = \dfrac{n(n+1)(4n-1)}{3}$.      5

16. a) Out of numbers 1 to 50, one number is selected at random. What is the probability that it is divisible by 4 or 5 ?      5

    b) State and prove Pigeon Hole principle.      5

17. a) If A = {1, 4}, B = {2, 3, 6} and C = {2, 3, 7}. Then verify that A × (B – C) = (A × B) – (A × C).      5

    b) Explain the steps of Hasse diagram.      5

18. a) Prove that $G = \{3^n | n \in Z\}$ is an abelian group under multiplication.      5

    b) Verify whether the relation R in real numbers R, defined by R = {(a, b) : a ≤ b} is an equivalence relation.      5

19. a) Write the converse, inverse and contrapositive of "If n is an integer then it is rational number".

    **5**

    b) There are 300 persons with skin disorder. 180 had been exposed to the chemical A, 75 to chemical B and 45 to both A and B. Find the number of individuals exposed to

    i) Chemical A but not chemical B

    **5**

    ii) Chemical B but not chemical A.

20. a) Write the truth table for the compound proposition

    **5**

    $p \vee (q \wedge r) \leftrightarrow [(p \vee q) \wedge (p \vee r)]$.

    b) A map $\phi : Z \rightarrow Z$ given by $\phi (n) = 2 n$, for any integer $n \in Z$. Verify whether

    i) $\phi$ is an homomorphism.

    **5**

    ii) $\phi$ is injective.

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