

B.C.A.- I (NEP) Semester-I
CC101 Paper-I - Mathematics Foundations to Computer Science

P. Pages : 2

Time : Three Hours



GUG/S/25/16187

Max. Marks : 60

- Notes :
1. All questions are compulsory and carry equal marks.
 2. Draw neat and labeled diagram wherever necessary.
 3. Avoid vague answers and write specific answer related to question.

Either:

1. a) Define set. Explain different types of sets with example. 6
- b) Prove by mathematical induction 6
- $$\left(\bigcup_{i=1}^n A_i \right) = \bigcup_{i=1}^n \overline{A_i}$$

OR

- c) Define statement. Explain various logical connectives with example. 6
- d) If $\begin{bmatrix} a+b & c+d \\ c-d & a-b \end{bmatrix} = \begin{bmatrix} 4 & 6 \\ 10 & 2 \end{bmatrix}$ 6
- Find a, b, c and d

Either:

2. a) Show that $p \vee (q \vee r) \equiv (p \vee q) \vee r$ 6
- b) What is principal disjunctive normal form? Obtain the principal disjunctive normal form of $\neg P \vee Q$. 6

OR

- c) Explain the four rules of predicate calculus. 6
- d) Show that $S \vee R$ is tautologically implied by $(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow S)$ 6

Either:

3. a) Determine the number of permutations for. 6
- i) HIPPOPOTAMUS
 - ii) EWTHUSIASM
 - iii) SUCCESS.
- b) Define relation. Write and explain various properties of relation. 6

OR

c) Write and explain the pigeonhole principle. 6

d) Let $A = \{a, b, c, d\}$, 6
 $R = \{(a, b), (a, c), (b, a), (b, c), (c, d), (d, a)\}$
Find the transitive closure of R .

Either:

4. a) Write a detailed note on group. 6

b) Let $A = \{-1, 0, 1\}$. Determine whether A is closed under 6
i) addition ii) multiplication

OR

c) If $(S_1, *)$ and $(S_2, *)$ are semigroups then $(S_1 \times S_2, *)$ is a semigroup, where $*$ is defined 6
by $(S'_1, S'_2) * (S''_1, S''_2) = (S'_1 * S''_1, S'_2 * S''_2)$

d) Show that identity element in a group is unique. 6

5. Attempt all the questions.

a) Let a, b and c are integers, if a/b and a/c , then $a/b+c$ 3

b) Construct a truth table for $\neg(P \wedge Q) \Leftrightarrow (\neg P \vee \neg Q)$ 3

c) To prove $P(n, n) = 2 \times P(n, n-2)$ 3

d) Write a short note on semigroup. 3
