

Q. 1 Attempt any four:

- a) State the inclusion - exclusion principle. How many positive integers not exceeding 100 are divisible by 3, 5 or 7?
- b) State the sum and product rule. How many bit string are there of length 8? Also find how many of them ends with two bits 00?
- c) State the Binomial theorem. Use it to prove:
- (i) $\sum_{k=0}^n \binom{n}{k} = 2^n$, for non negative integer n .
- (ii) $\sum_{k=0}^n \binom{n}{k} 2^k = 3^n$, for non negative integer n .
- d) State the Vandermonde's identity. Use it to prove $\binom{2n}{n} = \sum_{k=0}^n \binom{n}{k}^2$ for non-negative integer n .
- e) State and prove Pascal's identity.
- f) Define the term Grammar. Explain the types of Grammar.
- g) Define the term:
- (i) Turing Machine
- (ii) Finite state automata
- (iii) Types of languages.
- h) Consider following FSA. Find states, input letters, initial state, accepting state, $f(S_1, b)$. Also write its state table.

