

BACHELOR OF SCIENCE (COMPUTER SCIENCE) (CBCS - 2018 COURSE)
F.Y.B.Sc.(Computer Science) Sem-I :SUMMER- 2022
SUBJECT : MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

Day : Thursday
Date : 7/7/2022

S-20068-2022

Time : 11:00 AM-02:00 PM
Max. Marks : 60

N.B.

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Use of non-programmable **CALCULATOR** is allowed.

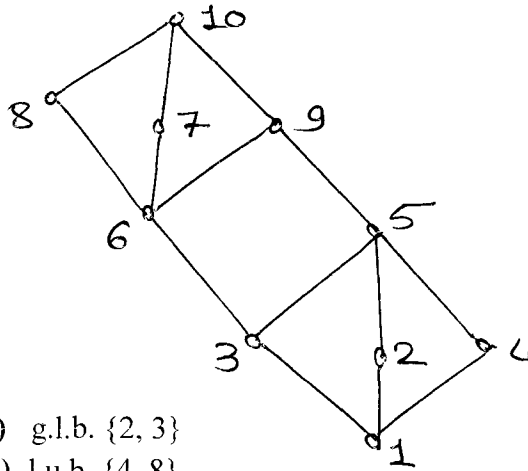
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- Q.1** Attempt **ANY TWO** of the following: **(12)**
- a) State and prove De-Morgan's laws by using truth table.
 - b) Translate into symbolic form and test the validity of the following argument:
If 6 is even, then 2 does not divide 7.
Either 5 is not prime or 2 divides 7.
But 5 is prime.
Therefore, 6 is not even.
 - c) Find the values of x and y in Boolean algebra for which:
i) $x + y = x y$ ii) $x + y' = x' y$
- Q.2** Attempt **ANY TWO** of the following: **(12)**
- a) In a bounded distributive lattice, if a complement of an element exists, then it is unique.
 - b) Find CNF of $f(x, y, z) = \bar{x} + (y(\bar{z} + x))$ and use it to find DNF of $f(x, y, z)$.
 - c) A committee of 5 is to be selected from among 6 boys and 5 girls. Determine the number of ways of selecting the committee, if it is to consist of at least one boy and one girl.
- Q.3** Attempt **ANY TWO** of the following: **(12)**
- a) State and prove principle of inclusion-exclusion for three sets.
 - b) How many strings of three decimal digits, with repetition allowed;
i) that begin with an odd digit
ii) have exactly two digits that are 4's.
 - c) Solve the recurrence relation: $a_n - 9a_{n-1} + 20a_{n-2} = 2 \times 5^n$; $a_0 = 0$, $a_1 = 1$.
- Q.4** Attempt **ANY THREE** of the following: **(12)**
- a) Solve the differential equation $a_r = 7a_{r-1} - 10a_{r-2}$ with initial conditions $a_0 = 4$, $a_1 = 17$.
 - b) Explain the terms:
i) Homogenous solution of a recurrence relation.
ii) Particular solution of a recurrence relation.
 - c) Prove that if x is an even integer then x^2 is an even integer by using direct proof method.

P.T.O.

- d) Write the negations of the following statements:
- There is an honest politician .
 - All children like 'Chota Bhim.'

Q.5 Attempt **ANY FOUR** of the following: (12)

- State whether a poset $(D_{12}, |)$ is lattice?
- Prove that ${}^n C_r = {}^n C_{n-r}$.
- How many arrangements of 'MANAGEMENT' are there in which the two M's are separated?
- The Hasse diagram of poset is given below:



- Find:
- g.l.b. $\{2, 3\}$
 - l.u.b. $\{4, 8\}$
 - upper bounds of $\{6, 5\}$.

- Determine if following proposition is tautology and justify your answer:
 $(\sim q \wedge (p \rightarrow q)) \rightarrow \sim p$.
- Find the homogenous solution of the below recurrence relation:
 $a_n - 2a_{n-1} = 3(2^n)$.

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