F.Y. B. SC. (COMPUTER SCIENCE) SEM – I (CBCS - 2016 COURSE) : SUMMER - 2018

SUBJECT : MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE (CS–14)

Day : **Wednesday**
Date : **18/04/2018**

S-2018-0794

Time : **11.00 A.M. TO 02.00 PM**
Max. Marks : 60

N.B.

1) All questions are **COMPULSORY.**
2) Figures to the right indicate **FULL** marks.

Q.1 A) Attempt the following: **(06)**

a) Negation of $p \Rightarrow q$ is

i) $\sim q \Rightarrow p$ **ii)** $p \vee \sim q$
iii) $\sim p \Rightarrow \sim q$ **iv)** $\sim q \Rightarrow \sim p$

b) In a bounded lattice which of the following is not true?

i) $x \vee 1 = 1$ **ii)** $x \vee 0 = x$
iii) $x \wedge 0 = x$ **iv)** $x \wedge 1 = x$

c) In the lattice D_{30}, the compliment of 5 is

i) 6 **ii)** 2
iii) 3 **iv)** 5

d) Which of the following is true?

i) Every modular lattice is distributive **ii)** Every distributive lattice is not modular
iii) Every distributive lattice is modular **iv)** Every lattice is complimented lattice

e) Which of the following is homogenous recurrence equation

i) $(a_n - a_{n-2} - a_{n-3})^2 = 0$ **ii)** $(a_n - a_{n-2} + 5)^2 = 0$
iii) $a_n - a_{n-1} = 5$ **iv)** $a_n - a_{n-2} = a_{n-3} + 5$

f) The number of ways to assign 24 students to 5 faculty advisors are

i) 5^{24} **ii)** 24^5
iii) 5x24 **iv)** None of these

B) Attempt the following: **(06)**

a) Write the dual of the following statement $y + \left(x \cdot (\bar{x} \wedge (y \wedge \bar{y})\right) = y$
b) Write any two rules of inference.
c) Write negation of the following statement $\forall x, (P(x) \wedge Q(x))$.
d) Define Modular lattice.
e) State inclusion and exclusion principle for two sets.
f) Define Homogeneous solution.

Q.2 Attempt any **THREE** of the following: **(12)**

a) How many integers not divisible by 3, nor by 5 nor by 7, among the integers 1 to 1000.

b) Prove that x is even if and only if x^2 is even, for any integer x.

c) Prove that every distributive lattice is modular.

d) Solve the recurrence relation $a_r - 8a_{r-1} + 16a_{r-2} = 0$ with initial condition $a_0 = 16$ & $a_1 = 80$.

Q.3 Attempt any **FOUR** of the following: **(12)**

a) Prove by direct method the following. If $\sim p \vee q,\ s \vee p,\ \sim q$ then s.

b) Draw Hasse diagram of the poset P = D_{30}.

c) How many three-digit numbers are there, with distinct digits, with each digit odd?

d) Solve the recurrence equation
$a_n = -4a_{n-1} - 4a_{n-2};\ a_0 = 0, a_1 = 1$

e) How many ways are there to arrange the seven letters in the word SYSTEMS?

Q.4 Attempt any **TWO** of the following: **(12)**

a) Prove the validity of the following argument by indirect method
$p \vee q,\ r \rightarrow \sim q,\ q \vdash \sim r$

b) Prove that the non-empty intersection of two sub-lattices of a Lattice L is a sub- lattice.

c) Draw Hasse diagram of (D_{45}, |) and find complement for each element if exists.

Q.5 Attempt any **TWO** of the following: **(12)**

a) State and prove inclusion exclusion principle for two sets.

b) Solve the Fibonacci relation
$a_n = a_{n-1} + a_{n-2}$ with the initial conditions $a_0 = 0, a_1 = 1$

c) Solve $a_r - 7\ a_{r-1} + 10a_{r-2} = 6 + 8r,\ a_0 = 1,\ a_1 = 2$.

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