F.Y. B. SC. (Computer Science) SEM – I (2014 COURSE) : SUMMER - 2019

SUBJECT: MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE – I

Day : Monday | **S-2019-1124** | Time : 12.00 NOON TO 02.00 PM
Date : 15/04/2019 | Max. Marks : 40

N.B.:

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

Q.1 Attempt **ANY TWO** of the following: **[10]**

a) Prove the following logical equivalence
$(p \wedge q) \wedge r \equiv p \wedge (q \wedge r)$

b) Test the validity of the following argument:
If it rains then I wear a raincoat. If it shines then I do not need a sweater. Either it rains or it shines moreover, I do need a sweater. Therefore, I wear a rain coat.

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

Q.2 Attempt **ANY TWO** of the following: **[10]**

a) Prove that y = z, if B is a Boolean algebra and $x, y, z \in B$ such that
$x \wedge y = x \wedge z$ and $x' \wedge y = x' \wedge z$.

b) Find DNF of the Boolean function
$f(x, y, z) = x\,(y + z)$

c) Solve the recurrence relation
$a_r - 8a_{r-1} + 16a_{r-2} = 0$
With initial condition $a_2 = 16$ and $a_3 = 80$.

Q.3 Attempt **ANY TWO** of the f following: **[10]**

a) Among the integers 1 to 300 find how many are not divisible by 3, nor by 5. Find also, how many are divisible by 3, but not by 7.

b) Prove that ${}^nC_r = {}^nC_{n-r}$.

c) Find the particular solution of the recurrence relation
$a_n = -5a_{n-1} - 6a_{n-2} + 42 \times (4^n)$.

Q.4 Attempt **ANY FIVE** of the following: **[10]**

a) Write negation of the following:
$\forall x\big(P(x) \wedge Q(x)\big)$.

b) Define the term Tautology.

c) Draw Hasse diagram for $(D_{24}, |)$.

d) Define modular lattice.

e) State Inclusion – Exclusion principle.

f) A library has at least 6 copies of each of the same book on algebra, geometry and calculus. In how many ways can we select 6 books?

g) Find first six terms of the sequence defined by the following recurrence relation
$a_n = a_{n-1} + 3a_{n-2}$; $a_0 = 1$, $a_1 = 2$.

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