F.Y. B. SC. (Computer Science) SEM – I (CBCS - 2016 COURSE) : SUMMER - 2019

SUBJECT :MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

Day Monday
Date 15/04/2019

Time : 11.00 AM TO 02.00 PM
Max. Marks :60

S-2019-1072

N. B. :

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

Q.1 A) Select the correct alternatives: **(06)**

i) Negation of statement $\exists x[\sim p(x) \wedge \sim q(x)]$ is________ .

a) $\forall x[p(x) \wedge q(x)]$ b) $\forall x[p(x) \vee q(x)]$
c) $\forall x[\sim p(x) \wedge \sim q(x)]$ d) $\forall x[\sim p(x) \vee q(x)]$

ii) The value of $\lceil 3.8 \rceil =$ _______ .

a) 3 b) 4 c) 5 d) None of these

iii) Dual of $(x \cdot y \cdot z) + (y \cdot z) =$ _______ .

a) $(x \cdot y \cdot z) \cdot (y \cdot z)$ b) $(x + y + z) + (y + z)$
c) $(x + y + z) + (y \cdot z)$ d) $(x + y + z) \cdot (y + z)$

iv) How many different number of ways can 3 digits number be form using the digits 2, 3, 4? ________ .

a) 27 b) 82 c) 12 d) 30

v) Which of the following is a non-homogenous recurrence relation: ____ .

a) $a_n + a_{n-1} + a_{n-2} = 5$ b) $a_n = a_{n-1} - a_{n-2}$
c) $\sqrt{a_n} + \sqrt{a_{n-1}} + \sqrt{a_{n-2}} = 0$ d) $a_n \cdot a_{n-1} = 0$

vi) In the bounded lattice which of the following is true ?__________ .

a) $x \vee 1 = 0$ b) $x \vee 0 = 1$
c) $x \wedge 0 = x$ d) $x \wedge 1 = x$

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

i) Write negation of the " Some peacocks dance and all elephants sings."

ii) State the inclusion-exclusion principle for three sets.

iii) Draw the Hasse diagram for $(D_{20}, |)$.

iv) Define a linear recurrence relation.

v) Prove the logical equivalence : $p \rightarrow q \equiv (\sim p \vee q)$.

vi) State the Pegion-hole principle .

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

a) How many ways 8 chocolates and 7 jellys can be distributed among 3 children such that each child want atleast one of each kind?

b) Test the validity of the following argument:
$R \rightarrow C, S \rightarrow \sim W, R \vee S, W \vdash C.$

c) Find the Disjunctive Normal Form (DNF) of the following boolean function:
f(x, y, z) = x(y+z) .

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

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

a) How many different ways can we arrange the word 'MANAGEMENT' ?

b) Prove the following logical equivalence:
$p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$.

c) Check whether the poset (D_{15} ,|) is lattice or not .

d) Show that if there are 30 students in a class, then atleast two have last names that begin with the same alphabet.

e) Find homogenous solution for the recurrence relation:
$a_n - a_{n-1} + 20a_{n-2} = 2 \times 5^n$.

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

a) State and prove the De-Morgan's laws by using truth tables.

b) How many different 5-card hands can be formed from the standard 52 card deck and what is the probability of hand containing 3 but not 4 aces ?

c) By using the proof of contradiction prove that $\sqrt{2}$ is irrational.

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

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

b) Prove that if $[B, -, \vee, \wedge]$ is a Boolean algebra than the complement a' of any element $a \in B$ is unique .

c) A committee of 5 members is to be selected from among 6 boys and 5 girls. Determine the number of differnt ways of selecting the committee, if it contains alteast one boy and one girl .

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