F.Y. B. SC. (Computer Science) SEM – I (CBCS - 2016 COURSE) : WINTER - 2018

SUBJECT : MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

Day : Monday
Date : 15/10/2018

W-2018-0896

Time : 11.00 AM 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) Choose the correct allernative **(06)**

i) The negation of $p \leftrightarrow q$ is ______.

a) $p \leftrightarrow \sim q$ b) $\sim p \leftrightarrow \sim q$
c) $(p \leftrightarrow \sim q) \wedge (q \leftrightarrow \sim p)$ d) $q \leftrightarrow \sim p$

ii) If x, y are elements of Boolean algebra then $x \oplus y$ ______.

a) $xy + \overline{xy}$ b) $\overline{xy} + \overline{xy}$
c) $x + \overline{xy}$ d) $y + x\overline{y}$

iii) The maximal element in $(D_{30},|)$ is ______.

a) 30 b) 15
c) 10 d) 1

iv) The total number solutions to the recurrence relation $a_n - a_{n-1} + 4a_n - 2 = 0$, $a_0 = 1$, $a_1 = 2$ is ______.

a) 0 b) 5
c) 2 d) Infinite

v) The total number of different ways to select 3 cards from a 52 cards deck is ______.

a) 1326×10^2 b) 1326×10^3
c) 1355×10^2 d) 1355×10^3

vi) The number of different solutions of the equation $x_1 + x_2 + x_3 = 20$ in non –negative integers is ______.

a) 123 b) 132
c) 213 d) 231

B) Answer the following **(06)**

i) Write the dual of the following statement $f(x,y,z) = x \cdot y \cdot z + \overline{x} \cdot \overline{y} \cdot \overline{z}$

ii) Prepare a truth table for $[(p \to q) \wedge p] \to q$.

iii) Find the homogenous solution for $a_n - 15a_n - 1 + 50a_n - 2 = 2x10^n$

iv) State the pegion-hole principle.

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

vi) Define the complemented lattice.

(P.T.O.)

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

a) Find the disjunctive normal form (DNF) of the Boolean function $f(x, y, z) = x\,(y + z)$.

b) Prepare the truth tables for conditional, converse, inverse and contrapositive statements.

c) How many different ways are there to arrange the letters in the word 'SYSTEMS' ?

d) Solve the recurrence relation $a_r = 7a_{r-1} - 10a_{r-2}$ with initial conditions $a_0 = 4$, $a_1 = 1$.

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

a) Give the direct proof to show that product of two odd integers is odd integer.

b) If the coin is flipped 10 times what is the probability of 8 or more heads?

c) Define the terms

i)The lower bound of lattice L.

ii)The upper bound of lattice L.

d) Prove the : $nP_r = (nC_r) \times (r!)$

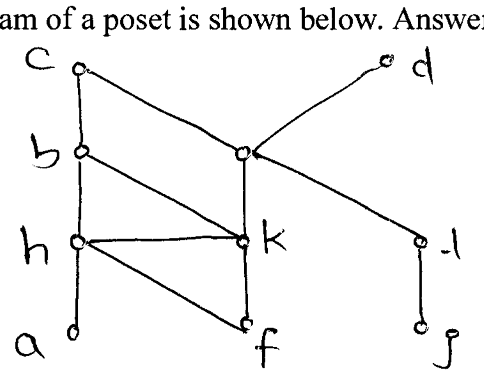
e) Find the six terms of the sequence defined by the following recurrence relation $a_n = a_{n-1} + 3a_{n-2}$, $a_0 = 1$, $a_1 = 2$.

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

a) Test the validity of the following argument

If it rains heavily and there is a high tide, then the roads get flooded. There is a high tide but the roads are not flooded. Therefore, it has not rained heavily.

b) The diagram of a poset is shown below. Answer the following:



i) What are the maximal elements?

ii) What are the minimal elements?

iii) What are the upper bounds for set {a, f, j}?

iv) What is the l.u.b. of set { a, f ,j,}?

v) What are the lower bounds of the set {k, l, h}?

vi) What is the g.l.b of set {k, l, h,}?

c) Solve the recurrence relation $a_n - 2a_{n-1} = 3^n$ where $a_1 = 1$

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

a) Find the total number of integers between the integers 1 to 1000 which are not divisible by 2, 3 and 7.

b) If 5 card hand is chosen at random from a 52 cards deck. What is the probability of obtaining a flush?

c) If [B, – , ∨, ∧] is a Boolean algebra, then the complement a' of any element $a \in B$ is unique.

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