F. Y. B. Sc. (COMPUTER SCIENCE) SEM-I (CBCS-2018 COURSE): WINTER-2018
SUBJECT: MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

Day: Friday
Date: 12/10/2018

W-2018-0887

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 Attempt **ANY TWO** of the following: **(12)**

a) State and prove De-Morgan's laws.

b) Translate into symbolic form and test the validity of the following argument:
If I work, I cannot study.
Either I work or I pass in Mathematics.
I passed in Mathematics.
Therefore, I studied.

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

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

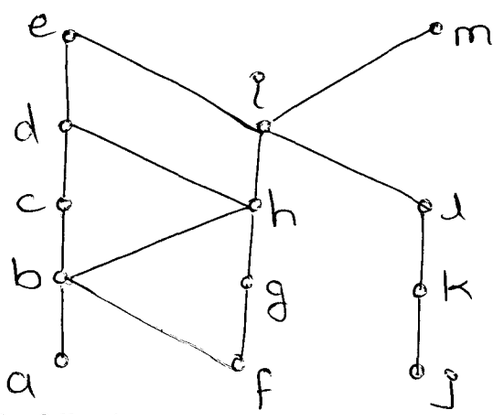
a) Find Disjunctive Normal Form (DNF) of the following Boolean function:
$f(x, y, z) = xy + x'z.$

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

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

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

a) The diagram of a poset is shown as below:



Answer the following:

i) What are the upper bounds for the set $\{a, f, j\}$?

ii) What are the lower bounds for the set $\{k, l, h\}$?

iii) State the greatest elements.

iv) State the least elements.

P.T.O.

b) How many 5- card hands can be formed from the standard 52-card deck? And what is the probability of obtaining 3, but not 4 aces?

c) How many integers between 1 to 1000 are divisible by 3 or by 5 or by 11?

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

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

b) Explain the terms:

i) Homogenous solution of a recurrence relation.
ii) Particular solution of a recurrence relation.

c) Check whether the following propositions are tautology, contradiction or contingency:

i) $\sim p \rightarrow \sim(p \wedge q)$ ii) $(p \rightarrow q) \wedge (p \wedge \sim q)$

d) Show that a poset $(D_{12}, |)$ is a lattice.

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

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

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

c) Prove by direct method: $\sim p \vee q,\ s \vee p,\ \sim q \mapsto s$.

d) Check whether the lattice $L = \{0, -1, -2, -3, ...\}$ of non-positive integers with respect to usual $\leq$ relation is bounded or not?

e) Let $\phi(x, y) : x + y = 0$, $x, y \in \mathbb{R}$.
Write truth values of the following with justification:
i) $\exists y \forall x \phi(x, y)$ ii) $\forall x \exists y \phi(x, y)$

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

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