F.Y. B. SC. (COMPUTER SCIENCE) SEM – I (CBCS - 2016 COURSE) : **WINTER - 2017**

SUBJECT : MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

Day : Monday
Date : 30/10/2017
Time : 11.00 A.M. TO 02.00 PM
Max. Marks : 60

W-2017-0702

N. B. ;

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

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

a) Negation of statement $\forall x\,[p(x) \wedge Q(x)]$

i) $\exists x\,[\sim p(x) \vee \sim Q(x)]$	**iii)** $\exists x\,[\sim p(x) \wedge Q(x)]$
ii) $\exists x\,[\sim p(x) \vee Q(x)]$	**iv)** $\exists x\,[\sim p(x) \wedge \sim Q(x)]$

b) Maximal element in $(D_{30}, |)$ is ________

i) 30	**iii)** 15
ii) 10	**iv)** 1

c) The value of $\lceil 3.8 \rceil$ = ______

i) 3	**iii)** 5
ii) 4	**iv)** None of these

d) Dual of $(x \cdot y \cdot z) + (y \cdot z)$ = ___________

i) $(x \cdot y \cdot z) \cdot (y \cdot z)$	**iii)** $(x + y + z) + (y + z)$
ii) $(x + y + z) + (y \cdot z)$	**iv)** $(x + y + z) \cdot (y + z)$

e) How many solutions the problem $a_n - a_{n-1} + 4\,a_{n-2} = 0,\ a_0 = 1$ have?

i) 0	**iii)** 5
ii) 2	**iv)** Infinite

f) How many number of way can be form 3 digits number using the digits 2, 3, 4?

i) 27	**iii)** 81
ii) 12	**iv)** None of these

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

a) Define Tautology.

b) Prove logical equivalence $p \to q \equiv (\sim p \vee q)$

c) Draw Hasse diagram for $(D_{20}, |)$

d) Define Complemented lattice.

e) Write the statement of Pigeon-Hole principle.

f) Define linear recurrence relation.

P. T. O.

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

a) Test the validity of following argument using truth table:

$p \rightarrow \sim q,\ \sim r \rightarrow p,\ q \mid - r.$

b) Find Disjunctive Normal Form(DNF) of following boolean function:

$f(x, y, z) = \mathrm{x}(\mathrm{y}+\mathrm{z})$

c) State and prove principle of exclusion – inclusion for two sets.

d) How many different arrangement of word 'MANAGEMENT'.

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

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

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

c) If coin is flipped 10 times what is probability of 8 or more heads.

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

e) Prove that $(p \wedge q) \wedge r = p \wedge (q \wedge r).$

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

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

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

c) Find the number of positive integers less than or equal to 1000 which are not divisible by 2, 3 and 7.

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

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

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

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

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