DHARMSINH DESAI UNIVERSITY, NADIAD
FACULTY OF TECHNOLOGY
B.TECH - Semester – IV(CE)
SUBJECT: (CE415) DISCRETE MATHEMATICS

INSTRUCTIONS:
1. Figures to the right indicate maximum marks for that question.
2. The symbols used carry their usual meanings.
3. Assume suitable data, if required & mention them clearly.
4. Draw neat sketches wherever necessary.

Examination	**: III[rd] Sessional**	**Seat No.**	**: CE-81**
Date	**: 26/03/2018**	**Day**	**: Monday**
Time	**: 10:00 AM to 11:15 AM**	**Max. Marks**	**: 36**

Q.1 Answer the following: **[12]**

a) Let G be a group under * and O(G) = 27, Is there any non-trivial subgroup? If yes, which are the possible orders of non-trivial subgroup? [02]

b) If possible, give Example of numeric function a_r and b_r such that a_r does not asymptotically dominate b_r, nor does b_r asymptotically dominate a_r. [02]

c) Give an example of finite ring which is not an Integral Domain. [02]

d) Give the principle of duality and list the basic properties of algebraic systems. [02]

e) Show that in a distributive lattice, if $b \wedge \bar{c} = 0$, then $b \leq c$. [02]

f) Define distributed lattice and give an example of non distributive lattice. [02]

Q.2 Attempt *Any three* from the following : **[12]**

a) Construct the deterministic FSM that recognizes the set of strings of 0s and 1s in each of which the number of 0s is even and the number of 1s is a multiple of 3. [04]

b) Construct the deterministic FSM that recognizes all binary sequences that either starts with a 0 and without consecutive 0s or starts with a 1 and without consecutive 1s. [04]

c) Define *Complement* element in a lattice. Show that in a distributive lattice, if an element has a complement then this complement is unique. [04]

d) Find the total solution for the difference equation given below: [04]

$$a_r - 6a_{r-1} + 9a_{r-2} = (r+2)3^r$$

Q.3 Attempt the following: **[12]**

a) Evaluate the sum: $1^2 + 2^2 + 3^2 + \ldots + r^2$ using generating function method. [04]

b) Prove that ker(f) is a normal subgroup of (G, *). [04]

c) Let $a_r = 1$, $r = 0$ and $c_r = 1$, $r = 0$; [04]
$= 0$, $r=1$ $= 0$ otherwise
$= -4$, $r=2$
$=0$ otherwise
if $c_r = a_r * b_r$ then $b_r = ?$

OR

Q.3 Attempt the following: **[12]**

a) Prove that finite integral domain is a field. [04]

b) Let a*H and b*H be two cosets of H. Then prove that a*H and b*H are Either disjoint or identical. [04]

c) If $A(z) = \dfrac{13z^2}{(1-2z)(1+3z)}$ then what is $a_r = ?$ [04]

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