SE-Comp.
Sem III (CBSGS)
DIS

12.12.14.

1/2

QP Code :14675

(3 Hours) [Total Marks : 80

N.B : (1) Question **No. 1** is **compulsory.**
(2) Solve any **three** questions out of remaining **three** questions.
(3) All questions carry **equal** marks as indicated by **figures** to the **right**.
(4) Assume appropriate data whenever required. State all assumptions clearly.

1. (a) Prove by mathematical induction $x^n - y^n$ is divisible by x-y. 5
(b) How many vertices are necessary to construct a graph with exactly 6 edges in which each vertex is of degree 2. 5
(c) Show that a relation is reflexive and circular if and only if it is an equivalence relation. 5
(d) Prove that the set G = {1, 2, 3, 4, 5, 6} is an abelian group under multiplication modulo 7. 5

2. (a) Is it possible to draw a tree with five vertices having degrees 1, 1, 2, 2, 4? 4
(b) Find how many integers between 1 and 60 are 8
(i) not divisible by 2 nor by 3 and nor by 5.
(ii) Divisible by 2 but not by 3 and nor by 5.
(c) Solve the recurrence relation $a_{r+2} - a_{r+1} - 6a_r = 4$ 8

3. (a) Show that $A \cap (B \oplus C) = (A \cap B) \oplus (A \cap C)$ 4
(b) State and explain Pigeonhole principle, extended Pigeonhole principle. How many numbers must be selected from the set {1, 2, 3, 4, 5, 6} to guarantee that at least one pair of these numbers add up to 7? 8
(c) Let R be a relation on set A = {1, 2, 3, 4}, given as 8
R = { (1, 1), (1, 4), (2, 2), (2, 3), (3, 2), (3, 3), (4, 1), (4, 4) }.
Find transitive closure using Warshall's Algorithm.

4. (a) Find the generating function for the following sequence 4
(i) 1, 2, 3, 4, 5, 6..........
(ii) 3, 3, 3, 3, 3..........
(b) Show that the (2, 5) encoding function $e:B^2 \to B^5$ defined by 8
e(00) = 00000 e(01) = 01110
e(10) = 10101 e(11) = 11011 is a group code.
How many errors will it detect and correct.
(c) Draw Hasse Diagram of D_{42}. Find the complement of each element in D_{42}. 8

5. (a) Define Distributive Lattice along with one appropriate example. 4

(b) Let the functions f, g, and h defined as follows : 8

$f: R \rightarrow R, f(x) = 2x+3$

$g: R \rightarrow R, g(x) = 3x+4$

$h: R \rightarrow R, h(x) = 4x$

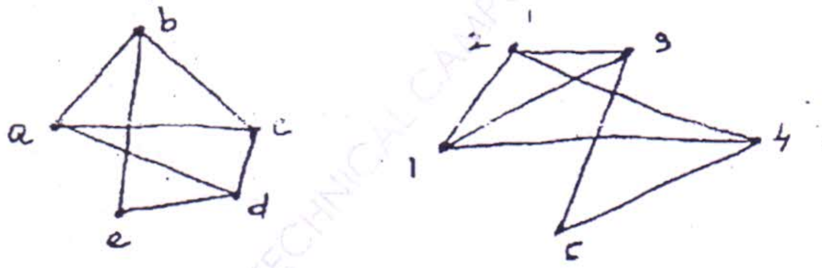
Find gof, fog, foh, hof, gofoh

(c) let $H = \left|\begin{matrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{matrix}\right|$ 8

Be a parity check matrix. Determine the group code $e_H: B^3 \rightarrow B^6$

6. (a) Determine if $[(p \Rightarrow q) \wedge \neg q] \Rightarrow \neg p$ is a tautology. 4

(b) Define isomorphic graphs. Show that following graphs are isomorphic. 8



(c) R be a relation on set of integers Z defined by 8

R={(x, y) | x-y is divisible by 3}

Show that R is an equivalence relation and describe the equivalence classes.
