S.E. (SEM - III) (CBSGS) (COMPUTER ENGG.)
DISCRETE STRUCTURE

3rd June 2016
3.00 pm to 6.00 pm

QP Code : **30745**

(3 Hours) [Total Marks :80

N.B. : (1) Question no. 1 is **compulsory.**
(2) Attempt any **three** questions from the remaining **five** questions.
(3) **All** questions carry equal marks as indicated by **figures** to the **right**.
(4) Assumptions made should be clearly stated.

1. (a) Find how many integers between 1and 60 are not divisible by 2 nor by 3 and nor by 5 respectively. 6

(b) By using mathematical induction prove that $1+a+a^2+....a^n = \frac{1-a^{n+1}}{1-a}$,where $n \geq 0$ 6

(c) Let A={1,2,3,4,5}and R be the relation defined by a R b if and only if a < b. Compute R, R^2 and R^3 .Draw digraph of R, R^2 and R^3 . 8

2. (a) Show that a group G is Ablian,if and only if $(ab)^2 = a^2 b^2$ for all elements a and b in G. 6

(b) Let A={1,2,3,4,6}=B,a R b if and only if a is multiple of b. Find R. Find each of the Following (i) R(4) (ii) R(G) (iii) R({2,4,6}). 6

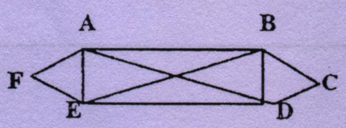
(c) Show that the (2,5)encoding function e: $B^2 \rightarrow B^5$ defined by e (00) = 00000 e (01) = 01110 e (10) = 10101 e (11) = 11011is a group code. How many errors will it detect and correct? 8

3. (a) State pigeon hole and extended pigeon hole principle. Show that 7 colors are used to paint 50 bicycles ,at least 8 bicycle will be of same color. 6

(b) Define distributive lattice .Show that in a bounded distributive lattice, if a complement exists ,its unique . 6

(c) Functions f,g, h are defined on a set,X= {1,2,3} as f = {(1,2) (2,3) (3,1)} g = {(1,2} (2,1) {3,3)} h = {(1,1) (2,2) (3,1)} (i) Find f o g, g o f are they equal ? (ii) Find f o g o h and f o h o g 8

4. (a) Define Eular path and Eular circuit,determine whether the given graph has Eular path and Eular circuit. 6



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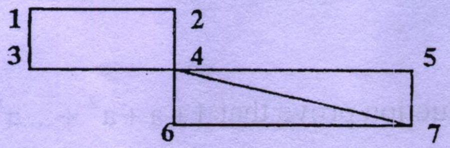
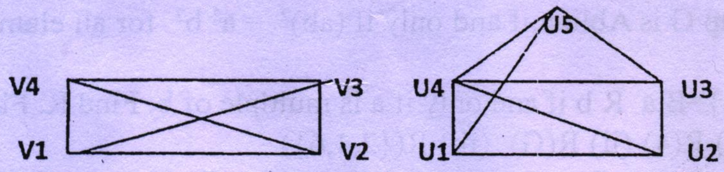
(b) Define Hamiltonian path and Hamiltonian circuit,determine whether the given graph has Hamiltonian path and Hamiltonian circuit . 6



(c) Define isomorphic graphs. Show that the following two graphs are isomorphic. 8



Fig(a) Fig(b)

5. (a) What is an Universal and existential quantifiers? Prove the distribution law. $(p \vee q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$ 6

(b) Let A={1,2,3,4}and let R={(1,2) (2,3)(3,4)(2,1)}Find transitive closure of R by using Warshall's algorithm. 6

(c) Prove that the set A={0,1,2,3,4,5} is a finite Abelian group under addition modulo 6. 8

6. (a) Find the ordinary generating functions for the given sequences: (i){1, 2 ,3,4,5 ----} (ii) {2,2,2,2 ----}(iii) {1,1,1,1----} 6

(b) Define group, monoid, semigroup. 6

(c) Solve the following recurrence relation: $a_n - 7a_{n-1} + 10\, a_{n-2} = 0$ with initial condition $a_0 = 1,\ a_2 = 6$ 8
