322452(14)

B. E. (Fourth Semester) Examination, Nov.-Dec. 2015

(New Scheme)

(CSE Branch)

DISCRETE STRUCTURES

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : All questions are compulsory. Part (a) from each question is compulsory. Attempt any ***two*** *parts from (b), (c) and (d) each question.*

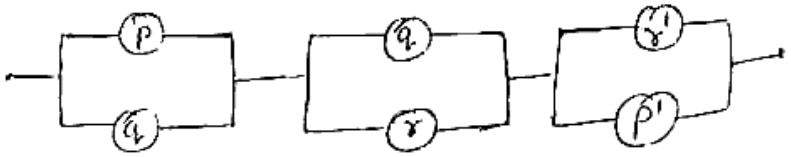
Unit-I

(a) Define Quantifiers. 2

(b) Define disjunctive normal form. Change the Boolean function $f(x, y, z)=\left[x+(x'+y)'\right]\cdot\left[x+(y'\cdot z')'\right]$ to disjunctive normal form. 7

(c) Define Boolean algebra prove De-Morgan's laws using the properties of Boolean algebra. 7

(d) Draw a simpler circuit for the following diagram and verify the equivalent circuits by truth tables. 7



Unit-II

2. (a) Define Set. Explain roster and set builder form with an example. 2

(b) Define function. If Q is the set of all rational numbers and $f: Q \to Q$ is defined by $f(x)=3x+2,\ x\in Q$, then prove that f is one-one and onto. Also find f^{-1}.

(c) Define equivalence relation. If R is an equivalence relation in the set A, then prove that R^{-1} is also an equivalence relation in the set A. 7

(d) (i) Explain the following with examples partial order relation lattice. 3

(ii) Draw the Hasse diagram for the partial ordering $\{(A, B)/A \subseteq B\}$ on the power set $P(S)$ where $S = \{a, b, c\}$. 4

Unit-III

3. (a) Define Homomorphism and Isomorphism. 2

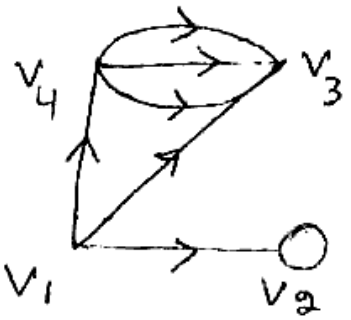
(b) Show that the set of cube roots of unity is an abelian group with respect to multiplication. 7

(c) State and prove Lagrange's theorem. 7

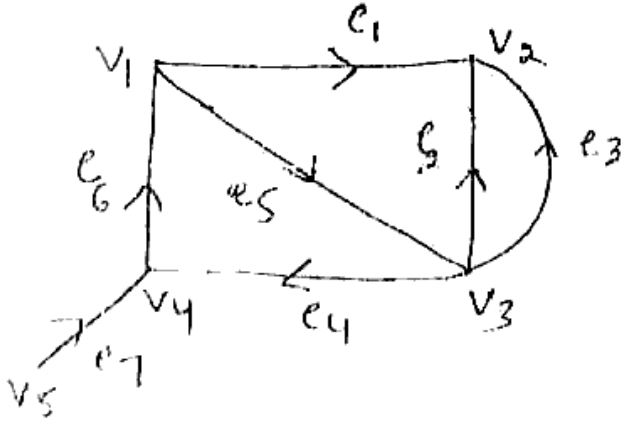
(d) Show that $S = \{a + b\sqrt{2} : a, b \in z\}$ for the operations $+, \times$ is an integral domain but not a field. 7

Unit-IV

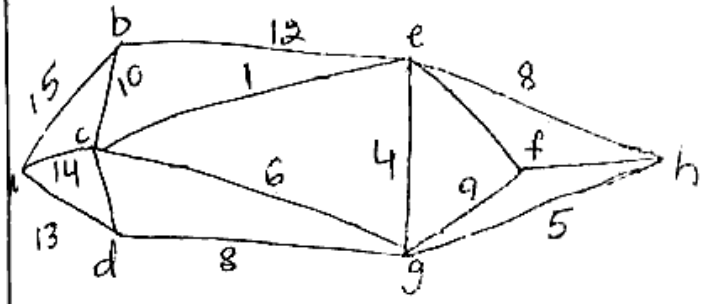
4. (a) Find the indegree and outdegree of each vertex for the following graph.



(b) Define and write the adjacency and incidence matrix of the following graph. 7



(c) Define spanning tree. Use Kruskal's algorithm to find the minimal spanning tree for the following graph 7



(d) Explain the following : 7

(i) Walk

(ii) Path

(iii) Circuit

(iv) Cut set

(v) Euler graph

(vi) Hamiltonian graph

Unit-V

8. (a) How many ways are there to arrange the nine letters in the word ALLAHABAD? 2

(b) What is mathematical induction? Show that $2^n > n^3$ for $n \geq 10$. 7

(c) Solve the recurrence relation

$$a_r - 6a_{r-1} + 8a_{r-2} = 0. \quad r \geq 2$$

with the boundary conditions $a_0 = 1$ and $a_1 = 4$. 7

(d) How many positive integers not exceeding 500 are divisible by 7 or 11? 7