(Following Paper ID and Roll No. to be filled in your Answer Books)

Paper ID : 2012265 Roll No. | | | | | | | | | | |

B.TECH.

Regular Theory Examination (Odd Sem-III), 2016-17

DISCRETE STRUCTURES AND GRAPH THEORY

Time : 3 Hours *Max. Marks : 100*

SECTION - A

Attempt all parts. All parts carry equal marks. Write answer of each part in short. (10×2=20)

1. a) Let R be a relation on the set of natural numbers N, as $R = \{(x, y): x, y \in N, 3x + y = 19\}$. Find the domain and range of R. Verify whether R is reflexive.

b) Show that the relation R on the set Z of integers given by $R = \{(a,b)$: 3 divides $a - b\}$, is an equivalence relation.

c) Show the implications without constructing the truth table $(P->Q)->Q => P \vee Q$.

d) Show that the "greater than or equal" relation (>=) is a partial ordering on the set of integers.

e) Distinguish between bounded lattice and complemented lattice.

f) Find the recurrence relation from $y_n = A2^n + B(-3)^n$.

g) Define ring and give an example of a ring with zero-divisors.

h) State the applications of binary search tree.

i) Define Multigraph. Explain with example in brief.

j) Let G be a graph with ten vertices. If four vertices has degree four and six vertices has degree five, then find the number of edges of G.

SECTION - B

Attempt any 5 questions from this section

(5×10=50)

2. Write the symbolic form and negate the following statements :

- Everyone who is healthy can do all kinds of work.
- Some people are not admired by everyone.
- Everyone should help his neighbors, or his neighbors will not help him.

3. In a Lattice if $a \le b \le c$, then show that

a) $a \vee b = b \wedge c$

b) $(a \vee b) \vee (b \wedge c) = (a \vee b) \wedge (a \vee c) = b$

4. State and prove Lagrange's theorem for group. Is the converse true?

5. Prove that a simple graph with n vertices and k components can have at most $\frac{(n-k)(n-k+1)}{2}$ edges.

6. Prove by induction: $\frac{1}{1.2}+\frac{1}{2.3}+.....+\frac{1}{n(n+1)}=\frac{n}{(n+1)}$.

7. Solve the recurrence relation $y_{n+2} - 5y_{n+1} + 6y_n = 5^n$ subject to the condition $y_0 = 0, y_1 = 2$.

8. a) Prove that every finite subset of a lattice has an LUB and a GLB.
   b) Give an example of a lattice which is a modular but not a distributive.

9. Explain in detail about the binary tree traversal with an example.

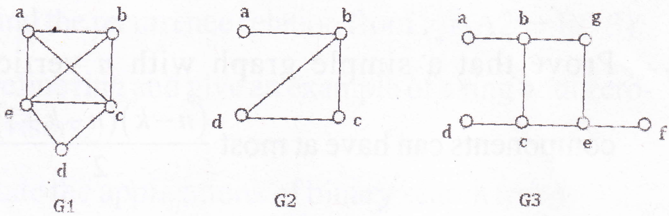
SECTION - C

Attempt any 2 questions from this section.

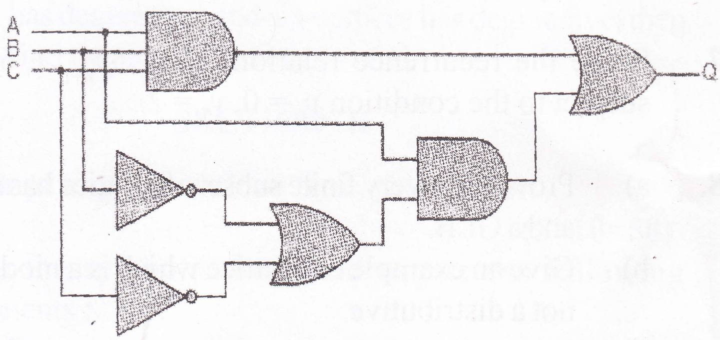
(2×15=30)

10. a) Prove that a connected graph G is Euler graph if and only if every vertex of G is of even degree.

b) Which of the following simple graph have a Hamiltonian circuit or, if not a Hamiltonian path?



11. a) Find the Boolean algebra expression for the following system.



b) Suppose that a cookie shop has four different kinds of cookies. How many different ways can six cookies be chosen?

12. a) Prove that every cyclic group is an abelian group.

b) Obtain all distinct left cosets of {(0), (3)} in the group $(Z_6, +_6)$ and find their union.

c) Find the left cosets of { [0], [3]} in the group $(Z_6, +_6)$.

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