Roll No. Total No. of Pages : 03

Total No. of Questions : 18

B.Tech. (CSE / IT) (2012 to 2017) (Sem.–4)

DISCRETE STRUCTURES

Subject Code : BTCS-402

M.Code : 71106

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

Answer briefly :

1. Define Euler graph.
2. Define ring with example.
3. What is the minimum number of NOR gate required to construct AND gate? Also construct it.
4. Differentiate between graph and tree.
5. Give an example of a semi group without an identity element.
6. Give an example of Hamiltonian circuit.
7. What is the number of vertices in a tree with n edges?
8. State the principle of inclusion and exclusion.
9. What are partial order relation?
10. Define graph coloring.

SECTION-B

11. Consider the following five relations on the set $A = \{1, 2, 3\}$:

$R = \{(1, 1), (1, 2), (1, 3), (3, 3)\}$, $\varnothing$ = empty relation

$S = \{(1, 1) (1, 2), (2, 1)(2, 2), (3, 3)\}$, $A \times A$ = universal relation

$T= \{(1,1), (1,2), (2, 2), (2, 3)\}$

Determine whether or not each of the above relations on A is : (a) reflexive; (b) symmetric; (c) transitive; (d) antisymmetric.

12. Consider all integers from 1 up to and including 100. Find the number of them that are:

a) Odd or the square of an integer;

b) Even or the cube of an integer.

13. Let a and b be integers. Find Q(2, 7), Q(5, 3), and Q(15, 2), where Q(a, b) is defined by:

$$Q(a,b) = \begin{cases} 5, & \text{if } a < b \\ Q(a-b, b+2) + a, & \text{if } a \geq b \end{cases}$$

14. Let G be any (additive) abelian group. Define a multiplication in G by $a * b = 0$ for every $a, b \in G$. Show that this makes G into a ring.

15. Find the general solution for third-order homogeneous recurrence relation $a_n = 6a_{n-1} - 12a_{n-2} + 8a_{n-3}$

SECTION-C

16. Show that K_n has $H = (n-1)!/2$ Hamiltonian circuits. In particular, find the number of Hamiltonian circuits for the graph K_5 in Figure 1.

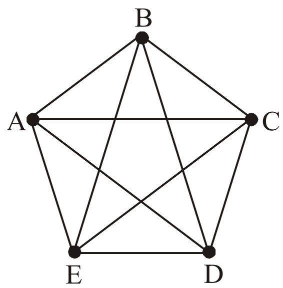

Fig.1

17. Suppose the preorder and inorder traversals of a binary tree T yield the following sequences of nodes :

    Preorder : $G, B, Q, A, C, K, F, P, D, E, R, H$

    Inorder : $Q, B, K, C, F, A, G, P, E, D, H, R$

    a) Draw the diagram of T.

    b) Find depth d of T

18. State and prove Euler's theorem in graph theory.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.