January 2016

Bachelor of Computer Application (BCA) Examination

V Semester

Discrete Mathematics and Linear Algebra

Time : 3 Hours] [Max. Marks : 40

Note : Solve any two parts from each question. All question carry equal marks.

1. (a) Define logical equivalence and show that:
$p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$.
(b) State and prove Demorgan's Laws for Boolean Algebra.
(c) Draw the switching circuit for the switching function $F(x, y, z) = x.y.z + (x + y).(x + z)$ and replace it by a simple one.

2. (a) Write the function $(xy' + xz)'$ in conjunctive normal form.
(b) Write the function : $f(x, y, z) = (x + y + z)(xy + x'z')$ into Disjunctive normal form.
(c) Define Binomial Net and draw the Binomial Net for following flow function:
$F(x, y, z) + xyz + xyz' + x'yz + xy'z$

3. (a) Prove that:
$A \times (B \cup C) = (A \times B) \cup (A \times C)$.
(b) Show that a necessary and sufficient condition for a non empty subset H of a group G to be a subgroup is that:
$a \in H, b \in H \Rightarrow ab^{-1} \in H$
where b-1 is the inverse of b in G.
(c) State and prove Lagrange's theorem.

4. (a) Prove that, the set of all ordered n types of the elements of F with vector addition and scalar multiplication is a vector space over F, where F be an arbitrary field.
(b) Show that the union of two subspace is subspace if and only if one is contained in other.
(c) Show that the Kernel of a linear map is a subspace of U(F).

5. (a) State and prove Cayley-Hamilton theorem.
(b) Find the eigen values and eigen vectors of matrix :
$$A = \begin{bmatrix} 1 & 2 & 2 \\ 0 & 2 & 1 \\ -1 & 2 & 2 \end{bmatrix}$$
(c) Find the rank of matrix :
$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 5 \end{bmatrix}$$

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