Roll No. : _____   Total Printed Pages : **3**

4E2027

B. Tech. (Sem. IV) (Back) Examination, June/July - 2011
Information Technology
4IT5 Discrete Mathematical Structures

Time : **3** Hours]

[Total Marks : **80**
[Min. Passing Marks : **24**

*Attempt any **five** questions.*
All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1._____Nil_____   2._____Nil_____

1 (a) Show that the following compound propositions are logically equivalent.

   (i) $p \rightarrow q$ and $\sim p \vee q$

   (ii) $p \leftrightarrow q$ and $(p \rightarrow q) \wedge (q \rightarrow p)$

8

   (b) Examine the validity of the following argument.

   $P_1 : p \rightarrow q, P_2 : p \rightarrow r, Q : p \rightarrow (q \wedge r).$

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2 (a) Show that p $\rightarrow$ q logically implies p $\rightarrow$ q that is
        (p $\leftrightarrow$ q) $\rightarrow$ (p $\rightarrow$ q) is a tautology.   8

   (b) Examine the validity of the following argument. "If prices are higher than wages are high. Prices are high or there are price controls. If these are price controls then there is not an inflation. There is an inflation therefore wages are high.

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3 (a) Prove that theorem 'If X is an odd integer, x^2 is odd integer.'

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(b) Prove that in a room of 13 people, 2 or more people have their birthdays in the same month.

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4 (a) Show that $1+2+3+\ldots+n = \dfrac{n(n+1)}{2}$ for all integer, n ≥ 1 by the principle of mathematical induction.

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(b) Prove that 5^n+3 is divisible by 4 for all integers n ≥ 0.

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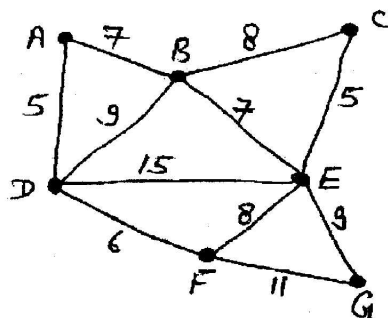
5 (a) Define union, intersection and product of two graphs.

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(b) A simple graph with n vertices and k components cannot have more than $\dfrac{(n-k)(n-k+1)}{2}$ edges.

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6 (a) Find the minimal spanning tree of the following weighted graph

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(b) If a connected graph G is Eulerian thenevery vertex of G has even degree.

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7 (a) Prove that if A and B are two non empty sets then $(A \cup B)' = A' \cap B'$

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(b) Define the following functions with examples :
(i) Floor and Ceiling functions
(ii) Div and Mod functions.

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8 (a) Prove that if $A \subset B$, $C \subset A$, $B \subset C$ then $A=B=C$

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(b) If function f is one-one onto then inverse off i.e. f^{-1} is also one-one onto.

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9 (a) Define group, monoids, semigroups and subgroups.

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(b) If G_1 and G_2 are two subgroups of a group G then prove that $G_1 \cap G_2$ is also a subgroup of G.

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10 (a) Define cyclic group, permutation group and dihedral group.

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(b) Write a short note on coding theory.

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