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BICS-008

B.Tech. – VIEP – COMPUTER SCIENCE AND ENGINEERING (BTCSVI)

Term-End Examination

00567

December, 2017

BICS-008 : DISCRETE MATHS STRUCTURE

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any **seven** questions. All questions carry equal marks.*

1. (a) Express the formula $P \rightarrow Q$ in terms of $\{\uparrow\}$ only. *2*

(b) Show the following equivalence : *4*

$(A \wedge (\sim A \vee B)) \vee (B \wedge \sim (A \wedge B)) \Leftrightarrow B$

(c) Which of the following formulae is ***not*** a tautology ? *4*

(i) $(P \rightarrow Q) \rightarrow (Q \rightarrow R)$

(ii) $(P \rightarrow Q) \wedge (Q \rightarrow P)$

2. (a) Show that

$(x)\,(P(x) \vee Q(x)) \rightarrow (x)\,P(x) \vee (\exists\, x)\,Q(x)$. *5*

(b) Using proof by contradiction, show that the following premises are inconsistent : *5*

$A \rightarrow (B \vee C)$, $B \rightarrow \sim A$, $D \rightarrow \sim C$, $A \Rightarrow A \rightarrow \sim D$

3. (a) Find the inverse of the following functions : *5*

(i) $f(x) = x^4 + 1$

(ii) $f(x) = \frac{10}{\sqrt[5]{7 - 3x}}$

(b) What do you mean by primitive recursive function ? Prove that $f(x, y) = x * y$ is a primitive recursive function. *5*

4. Consider the algebraic system, $(z, *)$, where $*$ is defined by $a * b = a + b - ab$. State whether $(z, *)$ is a group or monoid. *10*

5. A binary composition $*$ in R is defined by $a * b = a \cdot b^2$ for all $a, b \in R$. Determine whether $*$ is associative or not. *10*

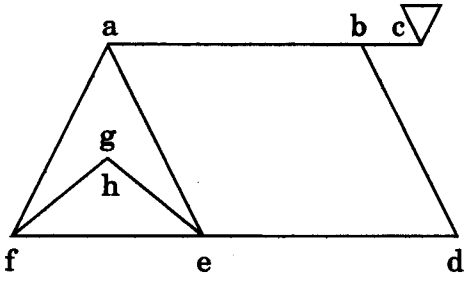
6. Solve the following recurrence relations :

(a) $a_n - 5a_{n-1} + 8a_{n-2} - 4a_{n-3} = n2^n$ *5*

(b) $a_n + 6a_{n-1} + 12a_{n-2} + 8a_{n-3} = 3^n$ *5*

7. (a) What is a spanning tree ? What is minimum cost spanning tree ? What are the different algorithms to compute minimum cost spanning tree ? Explain with suitable examples. *5*

(b) Draw dual of the following graph : 5



8. (a) What is chromatic number ? What is the chromatic number of the following ? 5

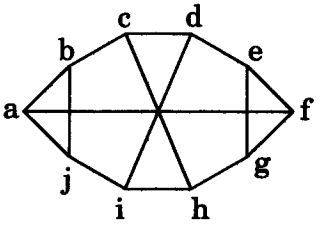
(i) Tree

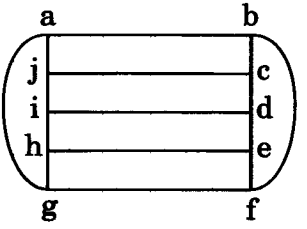
(ii) C_n

(iii) $K_{m, n}$

(iv) W_n

(b) Show whether the following graphs are isomorphic or not : 5





9. (a) Give the adjacency matrix of the graph G = ({a, b, c, d}, R), where R = {(a, b), (b, c), (d, c), (d, a)}. 5

(b) Define and explain Equivalence relation. 5

10. (a) State the binomial theorem. *5*

(b) Show that the number of r-permutations of a set of n (distinct) elements is given by

$$P(n, r) = \frac{n!}{(n-r)!}.$$ *5*