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THIRD SEMESTER   **B.Tech. (IT)**

SUPPLEMENTARY EXAMINATION   **(Feb-2019)**

IT-205 DISCRETE STRUCTURES

Time:3 Hours   Max. Marks: 50

Note:	Answer all questions.
	Assume suitable missing data, if any.

1. Answer the following questions. Each question carries 2 marks.

   (a) Construct a truth table for $(p \leftrightarrow q) \leftrightarrow (r \leftrightarrow s)$.

   (b) What is Selection Sort? Explain with an example.

   (c) Translate in two ways each of these statements into logical expressions using predicates, quantifiers, and logical connectives. First, let the domain consist of the students in your class and second, let it consists of all people.

    (i)   Everyone in your class has a cellular phone.

    (ii)   Everyone in your class is friendly.

   (d) Explain the principle of inclusion and exclusion. Give a formula for number of elements in the union of four sets.

   (e) Obtain Disjunctive normal form of $\neg(p \wedge q) \leftrightarrow (p \vee q)$

2. Answer the following questions. Each question carries 3 marks.

   (a) Explain Isomorphism of graphs with suitable examples.

   (b) What is depth first search. Write its algorithm.

   (c) Use proof by cases to show that $|xy| = |x| \, |y|$, where x and y are real numbers.

   (d) The Indian Cricket team consists of 16 players. It includes 2 wicket keepers and 5 bowlers. In how many ways can a cricket team of eleven players be selected if we have to select 1 wicket keeper and atleast 4 bowlers?

   (e) Explain pigeonhole principle. Show that for every integer n there is a multiple of n that has only 0s and 1s in its decimal expansion.

3. Answer the following questions. Each question carries 5 marks.

   (a) What is Quicksort? Explain with an example. Apply the Quicksort on the following data

   44,33,11,55,77,90,40,60,99,22,88,66

(b) Explain the principle of mathematical induction. Consider the sequence $a_0, a_1, a_2, \ldots$ defined by $a_0 = 1/4$ and $a_{n+1} = 2\,a_n(1 - a_n)$ for $n \geq 0$. A formula for the sequence a_n defined above, is
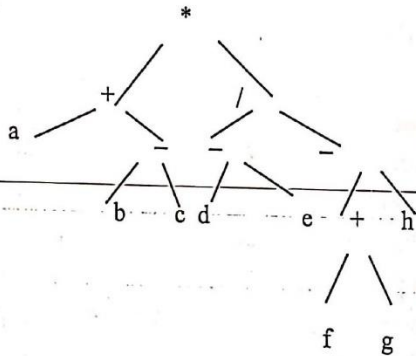
$$a_n = (1 - 1/2^{2^n})/2 \ , \forall n \geq 0.$$

Prove that the recursive formula is true by using proof by mathematical induction.

(c) Use Kruskal's algorithm to find a minimum spanning tree for the given weighted graph.
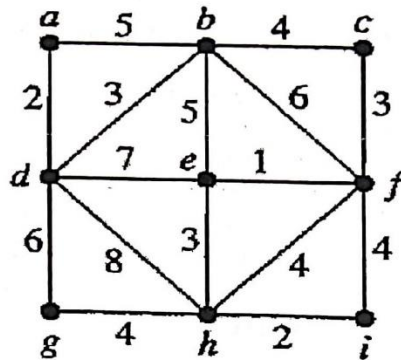
(d) Write the inorder, preorder and postorder for the following tree.

(e) Use a K-map to find a minimal expansion as a Boolean sum of products of each of these functions

(i) $wxy\bar{z} + wx\bar{y}\bar{z} + w\bar{x}yz + w\bar{x}y\bar{z} + w\bar{x}\bar{y}\bar{z} + \bar{w}xyz + \bar{w}xy\bar{z} + \bar{w}x\bar{y}\bar{z} + \bar{w}x\bar{y}z + \bar{w}\bar{x}yz + \bar{w}\bar{x}\bar{y}z$

(ii) $wx\bar{y}\bar{z} + w\bar{x}yz + w\bar{x}y\bar{z} + w\bar{x}\bar{y}\bar{z} + \bar{w}xy\bar{z} + \bar{w}\bar{x}y\bar{z} + \bar{w}\bar{x}\bar{y}z$

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