JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST-1 EXAMINATION, FEBRUARY 2016.
B.Tech II Semester (ECE/CSE/IT)

Subject Code: 10B11MA211 Maximum Marks: 15
Subject Name: Discrete Mathematics
Course Credits: 04 Time: 1Hr.

Attempt all questions. All parts of each question have to be answered in one place. Carrying of mobile phone in examination centre will be treated as unfair means case.

1. Suppose $H_j = 1 + \frac{1}{2} + \frac{1}{3} + ... + \frac{1}{j}$, where j is a positive integer. Using mathematical induction prove that **(3 Marks)**

$$H_{2^n} \geq 1 + \frac{n}{2}$$, where n is a non negative integer.

2. Among 18 students, 7 study mathematics, 10 study physics, and 10 study computer programming. Also, 3 study mathematics and physics, 4 study mathematics and computer programming, and 5 study physics and computer programming. Given that 1 student studies all three subjects. How many of these students study none of the three subjects? **(2 Marks)**

3. Using generating function, solve the following recurrence relation **(3 Marks)**

$$a_k = 2a_{k-1} - a_{k-2}, \quad k \geq 2, \; a_0 = 1, \; a_1 = 7.$$

4. Draw the Hasse diagram of poset $(P(\{\phi, \{\phi\}, \{\phi, \{\phi\}\}\}, \subseteq)$. **(2 Marks)**

5. Suppose R denote a relation on the set of integers such that $(a,b) \in R$ if and only if $a^2 + b$ is even. Show that R is an equivalence relation. Also find the equivalence class of 1, 3 and 5.

(3 Marks)

6. Give an example of a relation on {1, 2, 3, 4} which is **(2 Marks)**

(i) neither reflexive nor irreflexive but symmetric.

(ii) symmetric, antisymmetric, asymmetric and transitive.

(iii) reflexive, asymmetric and transitive.

(iv) reflexive, symmetric but not transitive.

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