School of Information Technology
IIT Kharagpur

Course Id: IT60112 Information and System Security (Class Test 2)

Date: March 25, 2011   **Total Time: 1 Hour**
Max. Marks: 40

1. Consider the UPA relation in an access control system implementing RBAC to be as follows:

UPA = { (u1,p1), (u5,p2), (u1,p2), (u1,p4), (u4,p3), (u1,p5), (u2,p3), (u2,p4), (u2,p2), (u2,p5), (u3,p2), (u3,p5), (u3,p1),

(u4,p4), (u5,p1), (u1,p3), (u5,p3) }

   (a) Construct a bipartite graph from the above relation.
   (b) Draw a biclique cover for this graph with 4 bicliques. From this biclique cover, write the UA and PA relations.
   (c) Consider a Boolean matrix representation of the UPA relation given above with users as rows and permission as columns. Make a decomposition of this matrix into two matrices A and B where rows and columns of A represent users and roles, respectively, and rows and columns of B represent roles and permissions respectively. The number of columns of A should be 3 and the decomposition is δ-consistent with the original matrix for a δ value of 6.   **[5+[6+4]+15=30]**

2. Write a periodic expression to represent an infinite set of time intervals that begin at 9:00 am of every Monday, Thursday and Saturday of the months of March, June and October of every year and last for 45 seconds.   **[10]**