1. Questions on RBAC.
   
a. In the figure below $p_i$’s represent permissions and $e_i$’s represent users. Their assignments to roles in the hierarchy are shown by the dotted arrows. [10]
   i. Find assigned_users($r$) and authorized_users($r$) for each $r$ in the figure.
   ii. Find assigned_permissions($r$) and authorized_permissions($r$) for each $r$ in the figure. [10]

1. Questions on Separation of Duty constraints [10, 10, 10]
   i. Let ($\{r_1, r_2, r_3, r_4\}$, 3) $\in$ SSD, which of the following UA sets are valid:
      • UA$_1$ = ($\{u_1, r_1\}$, $(u_2, r_1)$, $(u_3, r_1)$, $(u_4, r_2)$, $(u_5, r_2)$, $(u_6, r_2)$, $(u_3, r_3)$, $(u_4, r_4)$)
      • UA$_2$ = ($\{u_1, r_1\}$, $(u_3, r_1)$, $(u_5, r_1)$, $(u_2, r_2)$, $(u_3, r_2)$, $(u_5, r_2)$, $(u_2, r_3)$, $(u_4, r_4)$, $(u_5, r_3)$)
   Provide reasons for your answer.

   ii. Differentiate between SSD and DSD. Suppose we have ($\{r_1, r_2, r_3, r_4\}$, 3) $\in$ SSD and ($\{r_1, r_2, r_3, r_4\}$, 3) $\in$ DSD – what are the implications of having
both of these separation of duty constraints present in a system at the same time.

iii. Can the roles Senior Administrator and Senior Engineer of the role hierarchy shown above be in separation of duty? Give reasons.

iv. Give a transformation procedure for representing the Biba’s strict integrity policy (without the third rule) using RBAC. Argue that your transformation is correct.

2. Chapter 9

a. Do problem 9.8.2. Use MATLAB (or any other program using any language) to generate the table for $\phi(i)$. Submit your code for generating the $\phi(i)$ table. [20]

b. Do problem 9.8.3. [5]

3. Write a review/critique of the following article (atleast 2 pages using 12pt, single space). [25]


Here are some guidelines for what aspects of the paper to write about.
- Organization and presentation quality
  - Is the discussion coherent and well organized?
  - Can the language be improved to make concepts clearer?
- Novelty of the concepts presented in the paper,
  - Does the result presented have practical/theoretical significance?
  - Are the results presented significant enough for the journal publication?
  - Are the arguments convincing enough?
- Any other comments regarding how the paper can be made stronger
  - Is there something authors should explore further or address in depth?
  - Is there proper motivation and significance highlighted and adequate background, including related work discussed?

In case the paper is very good, say so and highlight the strong points.

I have put a sample review on the web. You can use the template of the sample review. But you are free to choose your own style.