Submission Policy: Submissions must be typed (not handwritten) and stapled hardcopies are to be turned in (no softcopies). Only two late submissions (max delay from due date is “two days”) per student are acceptable.

1. (True/False) (5 Points) An OS that implements the Biba strict integrity policy cannot be infected by executing malwares.
2. (10 Points) We want to implement a self-destructing OS, which self-destructs once its integrity level reaches a designated lowest level L. The integrity level of the OS at the boot time is the highest level H and decreases with every data it receives from the network. Write the name of the integrity policy that suits best for such an OS.
3. (30 Points) An XML database contains tree-structured XML documents. Each such XML document contains subtrees that belong to companies with the same conflict of interest. For example, one subtree stores the confidential information of the oil company Shell and another stores such information of British Petroleum. The requirement is that - if a user has already queried from a node ‘x’, then any future query can only be processed on the subtree with root ‘x’.
   a. Consider that the XML documents are both readable and writable. Which ones of the following integrity policies can be used to assign integrity levels to the nodes and meet the above requirement? Choose ALL the correct answers.
      i. Biba strict integrity policy
      ii. Biba Subject low-water mark integrity policy
      iii. Biba Object low-water mark integrity policy
      iv. Biba low-water mark integrity policy
      v. The Ring Policy
      vi. The Chinese Wall Model
   b. Consider that the XML documents are read-only. . Which ones of the integrity policies mentioned in (a) can be used to assign integrity levels to the nodes and meet the above requirement? Choose ALL the correct answers.
4. (True/False) (5 Points) Patching of kernel code in an OS that implements Biba strict integrity policy must be done by a process with the highest integrity level.
5. (10 points) In order to protect itself and the users completely from malware (includes viruses) infection, which integrity policy that an OS should implement, where the kernel has a higher integrity level than the user-level programs. Choose the answer from 3.a.(i)-(v).
6. (True/False) (5 Points) Any software that checks whether the size of each input is less than or equal to the size of the buffer it has allocated for that input cannot be vulnerable to buffer overflow attacks.
7. (True/False) (15 Points) Consider the recursive revocation with timestamp graph G in a database (taught in the class). Each edge from x to y with a timestamp as represented by a tuple <p, O, t(x,y)> means that x granted a permission p on data object O to y at time t(x,y). A revocation of right p on O by x would also be recursively applied on each node z such that that is a path x...z in G, in which every edge (u,w) has a tuple <p, O, t(u,w)> associated with it.
8. (True/False) (5 Points) Recursive revocation of privileges in a system is necessary, even if there is only one owner for each object and only the owner can grant such a privilege.
9. (True/False) (5 Points) A view definer of a view V can grant a privilege related to “ALTER” on V to another user.
10. (True/False) (5 Points) If there is no asymmetric key encryption scheme available, a TPM can be created using the symmetric key encryption.
11. (5 Points) Which evaluation assurance level requires designs to be formally verified and tested?