Week 3 - Assignment Solutions

1. We have simple DFA which accepts the given language. Since DFA, NFA and ϵ-NFA are all equivalent, option d is the correct option.
2. There was a mistake in the diagram, we will take care of that by the end of the evaluation.
3. The string "bb" is accepted by the DFA I and II but is not accepted by III, 'bac' ia accepted by I but not by II. Hence none of them are equivalent.
4. $a\epsilon\epsilon ba = aba$. Evaluating $a\epsilon\epsilon ba$ leaves you at state q_1 and ϵ-closure of $q_1 = \{q_0, q_1, q_2\}$
5. via ϵ you can reach q_1 and ϵ you can reach q_3 from q_1 and from q_3 to q_4 via ϵ
6. $\phi^* = \{\epsilon\}$ and not ϵ, $\phi + \epsilon = \epsilon$. So option c is correct.
7. Both the NFA and $\epsilon-$NFA has the regular expression $(0+1)(011+0(0+1))^*$. Hence both are equivalent.
8. $1(01)^* + 1(0+1)^*$ is accepted by the given $\epsilon-$NFA
9. Language accepted by $\epsilon-$NFA is 1^+. Complement of that is ϵ
10. You can reach q_2 from q_1 via ϵ and q_0 from q_2 via ϵ
11. $\hat{\delta}(q, xa) = \bigcup_{\delta \in P} \epsilon - closure(s)$. Given is q instead of s, hence false.
12. Option (a) is false as we only study finite automatons with finite states. Option (c) is false as maximum 2^n states are required. Option (b) is true as there exists a DFA that accepts language $(0+1)^*$ which has infinite number of strings.
13. There is a direct conversion from $\epsilon-$NFA to DFA
14. *babab* is not accepted as there is no transition for b from starting state
15. 111 is not accepted by DFA but accepted by $\epsilon-$NFA. Hence the conversion is wrong.