Solutions (Homework-4)

Solution 1: (25 Marks)
Sort the numbers using any sorting mechanism. Selection sort using swap works good. We need to handle the six possible orderings in which the three integers might occur. We will use the if ... then ... else if ... then ... else if … construction. A condition such as a <= b <= c is really the conjunction of two conditions: a <= b and B <= c. Note that the mean can be computed first, independent of the ordering.

Solution 2: (25 Marks)
If there is a 12 cent coin then Greedy Algorithm will not produce the optimal solution because dimes+nickel = 15 > 12-coin So for n=15, Greedy will produce 1 (12 cent coin) + 3(pennies) = 4 But the optimal solution is 1(dime) + 1 (nickel) = 2 coins

Solution 3: (25 marks)
a) Order the talks by starting time. Number the lecture halls 1, 2, 3, and so on. For each talk, assign it to lowest numbered lecture hall that is currently available. So, for example, using the talks (9:00-9:45, 9:30-10:00, 9:50-10:15, 10:10-10:25, 10:00-10:30, 10:15-10:45, 10:30-10:55, 10:30-11:00, 11:00-11:15, 10:55-11:25, 10:45-11:30,), we would assign the 9:00-9:45 talk to lecture hall 1, the 9:30-10:00 talk to lecture hall 2, the 9:50-10:15 talk to lecture hall 1, the 10:00-10:30 talk to lecture hall 2, the 10:10-10:25 talk to lecture hall 3, the 10:15-10:45 talk to lecture hall 1, the 10:30-10:55 talk to lecture hall 2, the 10:30-11:00 talk to lecture hall 3, the 10:45-11:30 talk to lecture hall 1, the 10:55-11:25 talk to lecture hall 2, and the 11:00-11:15 talk to lecture hall 3. Therefore three halls were sufficient.

b) This algorithm is optimal, because if it uses n lecture halls, then at the point the nth hall was first assigned, it had to be used (otherwise a lower-numbered hall would have been assigned), which means that n talks were going on simultaneously (this talk just assigned and the n - 1 talks currently in halls 1 through n - 1 ).

Solution 4: (25 marks)
a) Yes, b) Yes, c) No, d) Yes, e) Yes, f) Yes.