Question 1:

a) **Criterion= Duration of the courses.**

Based on this criterion, we sort them and start to assign them from the shortest course while avoiding conflicts.

Maximum-size of mutually compatible course: Course (5), Course (8), Course (10), Course (9).

b) **Criterion= Starting point of the courses.**

We sort the courses based on their stating hours.

Maximum-size of mutually compatible course: Course (3), Course (7), Course (10).

c) **Criterion= Ending point of the courses.** We sort the courses based on their ending hours.

Maximum-size of mutually compatible course: Course (1), Course (5), Course (9), Course (10).

d) We choose one of the above heuristics for example ending point of the courses as the criterion. Then, we fill each hall as much as possible respecting compatibility conditions. As soon as a class is filled, we eliminate the assigned classes from the list and implement the same heuristic to assign remaining ones and so on.

Result: we need 5 classes overall.

Question 2:

a) 2-Opt algorithm only accepts the improved solution. However, Simulated annealing might accept even a worse solution. The acceptance condition is probabilistic and depends on the current temperature of the algorithm.

b) There are two ways to modify the algorithm:

(i) To only accept imroving moves (Remove other acceptance method)

(ii) Setting the temperature of the system near zero. This has the effect of NEVER accepting worse moves.

c)

$f(x_c)$	$f(y)$	T	Random r	$e^{-\delta/T}$	Status
15	16	20	$0.34 <$	0.95	Accepted
13	25	25	$0.67 >$	0.61	Rejected
75	76	276	$0.91 <$	0.99	Accepted
1378	1256	100	0.82	n/a	Accepted

Question 3:

a) Lower bound= (Total distance)/n.

b) **Assumptions:**

(i) No congestion

(ii) Fixed rate of fuel burn

(iii) After each n kilometers at least there is one gas station.

In order to minimize the number of gas stations, the driver has to wait and try to fill the tank towards the end of the n kilometers subject to the fact that there is a gas station in the last k kilometers.