Quiz on Section 1 Results for SevdanurGenc

Correct answers are hidden.

Score for this attempt: **11.5** out of 12

Submitted Jun 17 at 11:16pm

This attempt took 10 minutes.

Question 1

1 / 1 pts

Given that $x_1 + x_2 + x_3 + x_4 + x_5 \leq 5$ should hold, select the penalty term corresponding to this constraint.

- (x_1+x_2+x_3+x_4+x_5+5)^2 = 0 where s is a non-negative slack variable.
- (x_1+x_2+x_3+x_4+x_5+s -5)^2 = 0 where s is a non-negative slack variable.
- (x_1+x_2+x_3+x_4+x_5-5)^2
- (x_1+x_2+x_3+x_4+x_5-s -5)^2 = 0 where s is a non-negative slack variable.

Question 2

1 / 1 pts

Select the penalty terms that correspond to the constraint $x = y$.

- [x] (x-y)^2
- [ ] xy-x-y
- [x] $x+y-2xy$
- [ ] xy

Question 3

1 / 1 pts

What is the objective value we can obtain for a feasible solution of the graph coloring problem?

- 10
- 0
- -5
- Not enough information

Question 4

1 / 1 pts

Suppose that Q is the QUBO matrix representing a graph coloring problem with two nodes and two colors.

$$Q = \begin{pmatrix} -1 & 2 & 1 & 0 & 1 & 0 \\ 0 & -1 & 0 & 1 & 0 & 1 \\ 0 & 0 & -1 & 2 & 1 & 0 \\ 0 & 0 & 0 & -1 & 0 & 1 \\ 0 & 0 & 0 & 0 & -1 & 2 \\ 0 & 0 & 0 & 0 & 0 & -1 \end{pmatrix}$$

Find out if the vector $x = (0, 1, 1, 1, 0, 1)$provides a feasible solution to the graph coloring problem or not.

- The vector provides an infeasible solution.
- The vector provides a feasible solution.

Question 5

1 / 1 pts

Greedy approach can always find an optimal solution to a graph colouring problem.

- ○ True
- ◉ False

Question 6

1 / 1 pts

A path through a graph that visits each vertex exactly once is called a Hamiltonian path.

- ◉ True
- ○ False

Question 7

1 / 1 pts

Variables in a QUBO problem must always be

- ○ Integer
- ○ Continuous
- ◉ Binary

Question 8

1 / 1 pts

Find the right QUBO matrix representation for the following objective function

$f(x_1, x_2, x_3) = -10x_1 - 2x_2 + 5x_3 + 3x_1x_2 + x_1x_3 + 2x_2x_3$

- (selected) $\begin{bmatrix} -10 & 3 & 1 \\ 0 & -2 & 2 \\ 0 & 0 & 5 \end{bmatrix}$
- $\begin{bmatrix} -10 & 3 & 1 \\ 0 & -2 & 2 \\ 0 & 0 & 10 \end{bmatrix}$
- $\begin{bmatrix} -5 & 4 & 8 \\ 0 & -3 & 2 \\ 0 & 0 & -8 \end{bmatrix}$
- $\begin{bmatrix} -1 & 3 & 1 \\ 0 & 0 & 2 \\ 0 & 0 & 5 \end{bmatrix}$

Question 9

1 / 1 pts

The objective function of the max-cut problem is

$\min \sum_{(i,j)\in E} x_i + x_j - 2x_ix_j$

- True
- (selected) False

Question 10

1 / 1 pts

The maximum cut of a bipartite graph is equal to the total number of edges in the graph.

- (●) True
- ( ) False

Question 11

1 / 1 pts

Suppose we have the penalty term $P \sum_{i=0}^{5} \left(\sum_{t=0}^{5} x_{i,t} - 1 \right)^2$ in our objective function and $P = 5$.

Given that the following binary variables are equal to 1 in the solution, what can you conclude about the penalty included in the objective value due to the above term?

$x_{2,0} = 1,\ x_{3,1} = 1, x_{5,2} = 1,\ x_{5,3} = 1,\ x_{4,4} = 1,\ x_{1,5} = 1$

- [ ] -5
- [ ] 0
- [x] 10
- [ ] 5

Partial

Question 12

0.5 / 1 pts

Suppose that Q is the QUBO matrix representing a TSP instance with 4 cities and the penalty coefficient is set to $P = 4$. Suppose for a given x, the value of $x^T Q x$ is-20. Which one of the followings can you conclude with certainty?

- [ ] The found route is feasible.
- [ ] Optimal solution has a cost less than or equal to 12.
- [ ] Optimal route has cost 12.
- [x] The cost of the found route is 12.
- [ ] The found route is optimal.

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