Homework Assignment 2

Submit the link to the GitHub repository where your code is located by 11:59PM, Tuesday, February 6. Your repository should include a separate .py file for each problem.
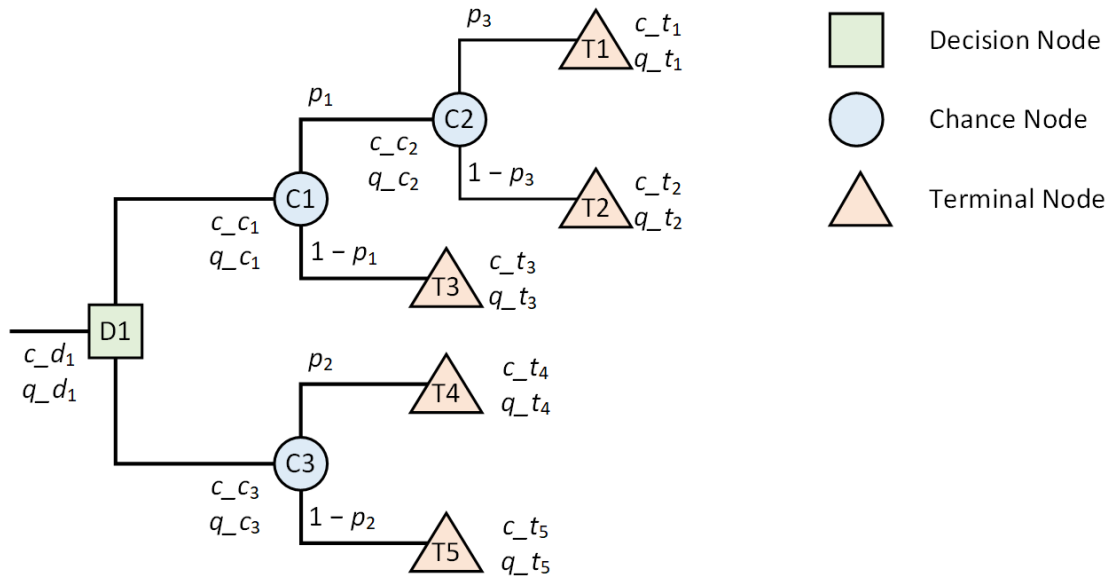
Problem 1: A Simple Hospital (Weight 1). We are interested in modeling a simple hospital where patients are admitted all together in the morning and are discharged all together in the evening. The hospital serves two types of patients: those who visit the emergency department and those who get hospitalized for a day. The hospital incurs $1,000 and $2,000 respectively for serving these patients. These costs are incurred at the time of discharge. Create a model that allow you to admit patients from each type, discharge them, and returns the total operating cost of the hospital for this day.

Hints: You will need these classes:

- Master class `Patient` from which two classes are derived: `EmergencyPatient` and `HospitalizedPatient`. `Patient` should have a member variable `name`, and an abstract method `discharge()` that will be overridden in derived classes. The `discharge()` method should prints the name and type of the patient when called.
- Class `Hospital` with attributes:
    o `cost` that will get updated whenever a patient gets discharged
    o `admit()` which admits a patient (could be of any type)
    o `discharge_all()` which calls the `discharge()` method on all patients
    o `get_total_cost()` which returns the total operating cost of the hospital for this day.

Test your model by admitting 2 patients that needs hospitalization and 3 patients that needs emergency service, discharging them, and printing the total cost.

Problem 2: Expected Health Utility (Weight 1). Modify the decision tree classes we implemented in class such that you can also get the expected health utility of alternatives in addition to the expected cost. Test your code on the decision tree below and print the expected cost and expected health utility of nodes C1 and C3. (Note: first download `Intro.py` file from the P4_DecisionTree branch of the Labs_IntroOOP repository to your local hard drive so that you can modify them and push them to your own repository).

Decision Tree

p_3 — T1: c_t_1, q_t_1

p_1 — C2 (c_c_2, q_c_2)

$1 - p_3$ — T2: c_t_2, q_t_2

C1 (c_c_1, q_c_1)

$1 - p_1$ — T3: c_t_3, q_t_3

D1 (c_d_1, q_d_1)

p_2 — T4: c_t_4, q_t_4

C3 (c_c_3, q_c_3)

$1 - p_2$ — T5: c_t_5, q_t_5

Legend:
- Decision Node (square)
- Chance Node (circle)
- Terminal Node (triangle)

Node	Cost	Health Utility	Probability of Future Nodes
T1	10	0.9	-
T2	20	0.8	-
T3	30	0.7	-
T4	40	0.6	-
T5	50	0.5	-
C1	25	0	$p_1 = 0.2$
C2	35	0	$p_3 = 0.7$
C3	45	0	$p_2 = 0.1$
D1	0	0	-