Exam 1, Geometric Algorithms, Jan 2023

Time 120 minutes. Write your answers in English legibly and comprehensibly. Add pictures whenever it can improve your answer.
(*The following is 1 of 3 questions on the exam.*)

1. problem. Consider the problem of finding the intersection points of a set of n line segments $s_1, \ldots, s_n$.
(a) Describe geometrically the basic idea of the sweep line algorithm. Draw a picture to illustrate it. (2pts)
(b) What events are stored in the event queue Q associated to the algorithm? How is Q updated? (1pt)
(c) What is stored in the balanced binary tree T? Draw a non-trivial example. (1pt)
(d) What is stored in the three sets U(p), L(p) and C(p) associated to an event p? (2pt)
(e) Describe what happens when the algorithm runs with input as in Figure 1.(4pts) *Note that I expect you to describe all updates to Q and T and reported intersection points as the algorithm runs. Do not draw T as a tree, just list its leaves. Do not describe the sets U(p), L(p) or C(p).*

FIG. 1