TAMPERE UNIVERSITY OF TECHNOLOGY
Department of Software Systems

OHJ-2556 **Artificial Intelligence** Examination
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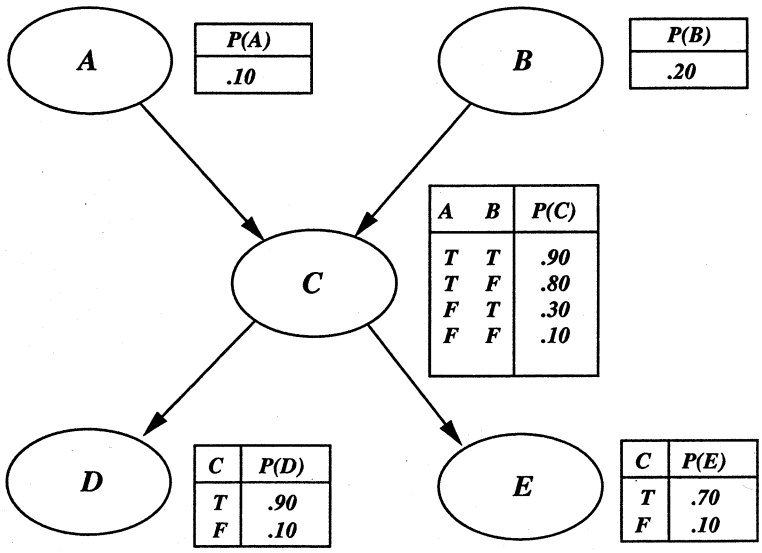
You may use a calculator in this exam, but all other extra material is prohibited. Give careful answers to all questions.

Answer questions 1 and 2, as well as two of questions 3–7. The maximum amount of points for questions 1 and 2 is 8 points and that of questions 3–7 is 7 points. Hence, altogether up to 30 points may be obtained from this exam.

1. Explain the uninformed search strategies in search trees. What are the pros and cons of each algorithm? Are they computationally efficient (as concerns time and space complexity)? What about completeness and optimality of each algorithm?
2. What probabilities do the following events have according to the semantics of the Bayesian network below? Explain briefly how did you derive the numerical probability values.
   (a) $(A, \neg B, \neg C, D, E)$
   (b) $(A, \neg B, C, \neg D)$
   (c) (A, B, C)
   (d) (D, E)



3. Prove that, if the heuristic function $h(n)$ never overestimates the cost to reach the goal, A* using h gives the optimal solution.

4. Optimal decisions in games and alpha-beta pruning.

5. Propositional logic and its inference methods. Give also the syntax of the logic and explain its semantics.

6. Inference in first-order logic, unification, and lifting.

7. (a) Inference using full joint probability distribution.
   (b) Independence of random variables.
   (c) Bayes' rule.