



# **SOUTH EASTERN KENYA UNIVERSITY**

## **UNIVERSITY EXAMINATIONS 2017/2018**

### **FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE AND BACHELOR OF INFORMATION TECHNOLOGY**

**CSC 322: ARTIFICIAL INTELLIGENCE PROGRAMMING**

**DATE: 7<sup>TH</sup> DECEMBER, 2017**

**TIME: 10.30 -12.30PM**

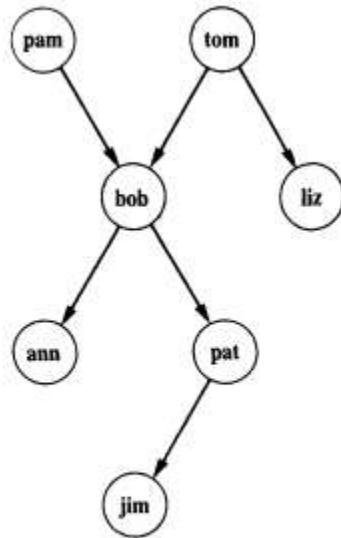
#### **INSTRUCTIONS TO CANDIDATES**

- a) Answer **ALL** questions from section A(Compulsory)
  - b) Answer **ANY TWO** questions from section B
- 
-

**SECTION A (30 MARKS )**  
*Compulsory*

1.

a. Use Fig 1 to answer the following questions



**Figure 1**

i. Write a prolog clause to ask the following questions and give the expected output:

1. Who are the children of tom?
2. Who is Liz's parent?
3. Who is a parent of whom? [6 marks]

ii. What will be the output of the following questions:

1. ?- parent(X,jim)
2. ?- parent( pat, X), parent( X, pat).
3. ?- parent( pat, X), parent( X, Y), parent( Y, jim). [6 marks]

b. You are designing an informed search algorithm to solve a problem of interest. Explain what a heuristic function is and why you might want to use one.

[4 marks]

c. Define what it means for a heuristic function to be admissible, and explain why it might be desirable for such a function to have this property. [6 marks]

d. Define the relation translate( List1, List2), to translate a list of numbers between 0 and 9 to a list of the corresponding words. [8 Marks]

**SECTION B (40 MARKS)**

*Attempt ANY TWO questions from this section*

2. Consider the following Prolog program, which is intended to define the third argument to be the maximum value of the first two numeric arguments:

```

max(X, Y, X) :- X >= Y, !.
max(X, Y, Y).
  
```

Required:

- a. Provide an appropriate query to show that the above program can give an incorrect result. [4 marks]
  - b. Explain the cause of the error. [6 marks]
  - c. Suggest a correction. [5 marks]
  - d. Write a Prolog program to find the maximum of a list of numbers. [5 marks]
3. One of the regulations of the International Rugby Board (IRB) states that for a player to be eligible to play for a given country, the player's father or mother or grandfather or grandmother must have been born in that country. Assume that there is a complete genealogical database consisting of Prolog clauses of the form `person(P, B, F, M)`, where P is a person's name, B is the country of P's birth, F is their father's name and M is their mother's name. For example, the clause  
`person(bruce, australia, rhodri, bronwyn)`  
might appear in such a database. Further assume that names in the database are constructed so as to refer uniquely to individuals.
- a. Write Prolog clauses defining the predicate `eligible` such that goals of the form `eligible(P,C)` succeed if and only if person P is eligible to play for country C according to the above regulation. [10 marks]
  - b. Given a list of players on a given country's team, define a predicate `checkteam` that will check each member of the team for eligibility according to the `eligible` predicate, and furthermore check that each player appears on the list only once. The `checkteam` goal will fail if any player is ineligible or if any player is listed more than once. [10 marks]
- 4.
- a. Assume that a rectangle is represented by the term `rectangle( P1, P2, P3, P4)` where the P's are the vertices of the rectangle positively ordered. Define the relation `regular( R)` which is true if R is a rectangle whose sides are vertical and horizontal. [8 marks]
  - b.
    - i. Write a goal, using `conc`, to delete the last three elements from a list L producing another list L1. Hint: L is the concatenation of L1 and a three-element list. [4 marks]
    - ii. Write a sequence of goals to delete the first three elements and the last three elements from a list L producing list L2. [4 marks]
  - c. Define the predicate `palindrome( List)`. [4 marks]