**Department of Mathematics**

**Ahmadu Bello University, Zaria**

**Second Semester Examination 2008/2009**

**COSC 208: Introduction to Artificial Intelligence**

**Instruction: Answer any FOUR Questions. Time Allowed: 2 Hours**

1. One of the bottlenecks in building knowledge based system is knowledge acquisition. Explain what you understand by knowledge acquisition and state the problems encountered by knowledge builders in building knowledge base system.
2. Derive the knowledge encoded in the semantics network bellow:



1. Given the graph bellow representing a given search space, where node A represents the initial state and node C the goal state (that is the system is to search the node C, starting from node A):
2. show the order in which, the nodes will be visited if the searching technique used is depth first search
3. show the order of which, the nodes will be visited if the searching technique used is breath first search
4. The missionaries and cannibals problem involves three missionaries and three cannibals that find themselves together on one side of the river. They wish to cross to the other side of the river using a boat that can carry only two persons. Assuming, the missionaries are safe so far their number is greater than or equal to the number of cannibals whenever they are together.
5. Represent the problem as a state problem and identify the initial state and the goal state.
6. Identify the operators that can be used in solving this problem.
7. By using forward searching, show how the system can arrive at the goal state.
8. Studies by Patel show that, the key differences between experts and novices in medicine is the highly organized knowledge structures of the experts, and not the explicit strategies or algorithm. Health professionals acquire their expert knowledge by contact with similar problems over many years. They keep in mind the resulting conclusions, applied practices particularly in the context of solved tasks and applied them in the future similar case.
9. State the differences between the reasoning strategy in rule based expert system and that of case based system
10. Argue whether this finding encourages the building of expert system using rule based approach or case based approach.
11. Given the following rules in a “backward-chaining” expert system application:

If (A AND B) THEN C (with CF=0.9)

If (C OR D) THEN E (with CF=0.75)

If F THEN A (with CF=0.6)

If G THEN D (with CF=0.8)

Evaluate the certainty factor (CF) of E assuming the system can conclude the following facts with confidence.

CF(F)=0.9

CF(B)=0.8

CF(G)=0.7

1. Explain what you understand by artificial intelligence and describes the characteristics of problems that are generally referred to as artificial intelligence problems.
2. The following story is from N. Wirth’s (1976) *Algorithms+ data structure=programs*.

“I married a widow (let call her W) who has a grown-up daughter (call her D). My father (F), who visited us quite often fell in love with my step-daughter and married her. Hence my father became my son -in- law and my step daughter became my mother. Some months later, my wife gave birth to a son (S1), who became the brother-in-law of my father, as well as my uncle. The wife of my father that is my step-daughter also had a son (S2).”

1. Define the following basic family relationship using predicate logic: grandfather, father-in-law, uncle.
2. Using predicate logic, create a set of expressions that represent the situations in the above story
3. Write a short note of the following concept related to artificial intelligence

Backward chaining, natural language understanding, heuristic search, Planning

1. Consider the following rules:

Rule 1: IF fuel rise THEN transport rise

Rule 2: IF naira fall THEN fuel Fall

Rule 3: IF fuel fall THEN transport fall

Rule 4: IF naira rise THEN fuel rise

1. While reasoning under uncertainty using the method based on probability, find the probability that “transport rise” knowing that “fuel rise” . Assume the following probability values:

P(fuel rise/transport rise)=0.6 P(transport rise) =0.7

P(fuel rise/transport fall)=0.2 P(transport fall)=0.3

1. Explain what you understand by expert system and state the functions of the main elements of a rule based expert system.
2. represent the following knowledge using predicate logic
3. If it doesn’t rain on Monday, Tom will go to the mountains
4. All basketball players are tall
5. Nobody likes taxes.
6. Emma is a teacher and a footballer.
7. Alkali is the exam officer.