ROLL NO. _____

Code: AC20/AT21 Subject: ARTIFICIAL INTELL. & NEURAL NETWORKS

AMIETE – CS/IT (OLD SCHEME)

Time: 3 Hours **OCTOBER 2012** **Max. Marks: 100**

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 Minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 Choose the correct or the best alternative in the following: (2×10)

a. Artificial Intelligence techniques include

(A) perception
(B) natural language understanding
(C) problem solving in chemical analysis
(D) all of these

b. Suppose we want to travel from our home to an unfamiliar place. What reasoning will be better to search a path for the journey?

(A) Forward reasoning **(B)** Backward reasoning
(C) Both **(A)** & **(B)** **(D)** None of these

c. $\neg p \Rightarrow q$ means

(A) $p - q$ **(B)** $p \vee q$
(C) $p \wedge q$ **(D)** $\neg p \vee q$

d. In production system, the knowledge is encoded in the form of

(A) if-then-else rule **(B)** semantic networks
(C) frames **(D)** CD formalism

e. Learning by analogy involves learning

(A) from a single training instance by explaining it.
(B) from a teacher or a knowledge source.
(C) new concepts through use of similar concepts and their solutions.
(D) None of these.

f. Let S and T be two fuzzy sets of SMART and TALL people respectively. If the member grade of Bob being smart is 0.7 and being tall is 0.7, then the member grade of Bob being smart and tall is

(A) 0.49 **(B)** 0.14
(C) 0.7 **(D)** 0.0

g. Declarative meaning of the rules
p : - *a*, *b*.
p :- *c*.

(A) $p \Leftarrow (a \vee b) \wedge c$ **(B)** $p \Leftarrow (a \wedge b) \wedge c$
(C) $p \Leftarrow (a \wedge b) \vee c$ **(D)** $p \Leftarrow (a \vee b) \vee c$

h. Minimax procedure (in Game playing) is

(A) Breadth-first search **(B)** Depth-first search
(C) Best-first search **(D)** Random search

i. Momentum term in Backpropagation learning is used to increase the

(A) speed of learning **(B)** convergence
(C) weight adaptation **(D)** none of these.

j. Sigmoid function is so important and popular activation function in neural networks, because

(A) Is squashes
(B) It is semi linear (i.e. non decreasing and differentiable everywhere).
(C) The derivative of the sigmoid is very easy to form.
(D) All of these.

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

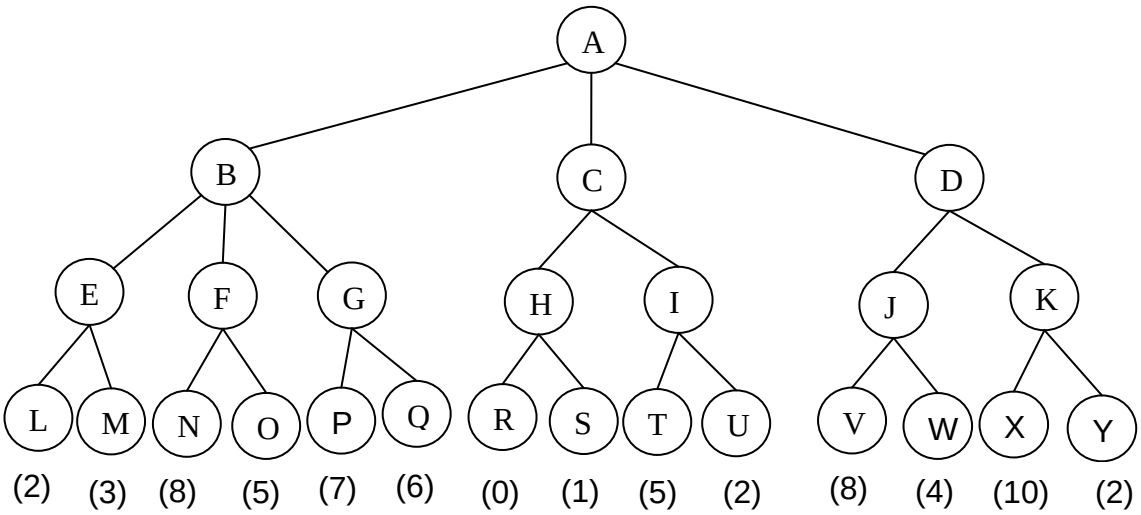
Q.2 a. Consider the following problem:
A farmer wants to transfer his belongings, a wolf, a goat and a cabbage, by a boat from the left bank of a river to its right bank. The goat can carry at most two items including the farmer. If unattended, the wolf may eat up the goat and the goat may eat up the cabbage. How should the farmer plan to transfer the items? List the production rules and show the state space diagram to solve the problem. **(8)**

b. If a problem-solving search program were to be written to solve each of the following types of problems, determine whether the search should proceed forward or backward:
(i) water jug problem
(ii) blocks world **(8)**

Q.3 a. Write a prolog program to split a list of numbers into two lists: Positive_list that includes positive numbers as well as zero and Negative_list that includes negative numbers. **(10)**

b. Differentiate between
(i) Linear & Non-Linear planning.
(ii) ATN & RTN. **(6)**

Q.4 a. Consider the following game tree in which the static scores (in parentheses at the tip nodes) are all from the first player's point of view. Assume that first player is the maximizing player.



(i) What move should the first player choose?s
(ii) What nodes would not need to be examined using the alpha-beta algorithm- assuming that nodes are examined in left-to-right order? **(10)**

b. Draw semantic network of the following sentence
Kavita gives a book to her friend. **(6)**

Q.5 a. Assume the following knowledge:
(i) Steve only likes easy courses.
(ii) Science courses are hard.
(iii) All the courses in the basketweaving department are easy.
(iv) BK801 is a basketweaving course.
Convert the above knowledge into clausal form and use resolution to answer the question, "What course would Steve like?" **(10)**

b. Suppose that there are *n* and *m* number of two unary predicates *p* and *q* respectively in prolog program. How many times will prolog interpreter backtracks (including shallow and deep both) for each of the following queries?
(i) ? *p*(X), *q*(Y)
(ii) ? *p*(X), !, *q*(Y) **(6)**

Q.6 a. Differentiate between learning by induction and learning by analogy. **(6)**

b. Describe the Hopfield model, the learning rule. Why do we say that the network performs an associative memory? **(10)**

Q.7 a. Discuss goal stack planning with an example. **(8)**

b. Suppose that 'abnormal marks out of ten' is defined as the fuzzy set:
$f_{ABNORMAL}$ = { (0, 0.1), (1, 0.9), (2, 0.7), (3,0.5), (4, 0.3), (5,0.1),
(6, 0.1), (7,0.3), (8, 0.5), (9, 0.9), (10, 0.9)}
and 'high marks out of ten' is defined as the fuzzy set:
f_{HIGH} = {(0, 0), (1, 0), (2, 0), (3,0.1), (4, 0.2), (5,0.3),
(6, 0.4), (7,0.6), (8, 0.7), (9, 0.8), (10, 1.0)}
Derive the composite function 'abnormally high marks out of ten.' **(8)**

Q.8 a. Define Expert system. Discuss the architecture of Expert System and explain its components. **(8)**

b. How is Bayesian network useful in handling uncertainty in probabilistic reasoning system? **(8)**

Q.9 Write short notes on the following (any **FOUR**)

(i) Skolemization
(ii) Cut and Fail predicates in PROLOG
(iii) Backpropagation Algorithm
(iv) Context free grammer.
(v) Expert System Shells **(4×4)**