BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
HYDERABAD CAMPUS
CS F407/EA C461: Artificial Intelligence
Assignment No: 2   **Total Marks**: 18   **Submission Date**: 30/10/2015

Q.1 AI researchers have developed several **Expert System shells** (JESS, a java based expert system shell; CLIPS from NASA, an acronym for C language integrated production system) for the development of Expert systems. These shells are empty Expert System knowledge bases, which have the structure and interface already written for you; all you add is the knowledge. Instead of writing an Expert System from scratch, for this assignment you will be using a small Expert System shell to design and implement an expert system. You may also use any other experimental expert system shell (from net).

Students with first even ID number in the group (sorted) should build the project (a), and with odd ID should build the project number (b).

(a) Many rural areas have extremely limited access to medical advice. People travel long distances to clinics, or medical facilities and there is a shortage of medical experts in most of these facilities. This results in slow service, and patients end up waiting long hours without receiving any attention. Hence medical expert systems can play a significant role in such cases where medical experts are not readily available. A Diagnosis expert system (DExS) can help a great deal in identifying those diseases and describing methods of treatment to be carried out. Design a knowledge-base expert system that aims to provide the patients with medical advice and basic knowledge on various diseases. It should consider various symptoms and signs like chest pain, cough, fainting, fatigue, headache, back pain, vertigo, sunken eyes, low body temperature, restlessness, sore throat, fever etc. along with its severity status and provide the patients with medical advice.

(b) Build an Expert System that can recommend restaurants by asking the user questions about their preferences regarding their characteristics, having at least 5 different restaurants to distinguish among. The Expert System is to make its recommendations based on the features of a restaurant which would be significant to the average customer; these features should include such things as the style of service at the restaurant (sit-down, fast food, buffet), the kind of food served (Vegetarian, Non-vegetarian, etc.), the average cost of a meal (cheap, medium, expensive), and so on.

You have to use an expert system shell for developing this expert system. You may use any shell accessible to you. You may refer to the url given here for few expert system demos: http://www.aiinc.ca/demos/

Q.2 Write a program to propagate justifications and test it out on any **TMS** (Truth Maintenance System). Here, you will require devising data structures (in whatever language you are programming) to represent nodes and justifications, in such a way that the information required by propagate-justification and get-status-if-possible is available. You may also find it convenient to write some programs to help you enter the nodes and justifications when setting

up a TMS. The procedure get-status-if-possible tries to determine the status of a single node in the TMS, given the partial assignment.

Q.3 Write a program to build a **Bayesian Network** using Bayes theorem. Bayesian Network is a directed acyclic graph (DAG) and models an uncertainty domain. Each node of the DAG represents discrete random variable and includes the states of the random variable with conditional probability table (CPT). The relation between the nodes is a parent-child relationship which indicates a causal dependency of the variable of a node to the variable of the parent node. The CPT of a node indicates the probability of the node being in a state given the states of its parent nodes. The aim of a Bayesian network is to gather the probabilities of hypothesis variable being in a state according to the evidences supplied by the information. Develop Bayesian networks for realistic problems, using tools such as SamIam or Genie.

SamIam is a software tool for the creation and consultation of Bayesian networks. The SamIam software package can be downloaded from: http://reasoning.cs.ucla.edu/samiam/

SamIam is java-based and runs on all operating systems.

An alternative package is Genie,a Windows-based system, which, however, also runs on Linux using wine; it contains much more functionality than SamIam. However, as a consequence of this, Genie it is less easy to use than SamIam. Genie can be downloaded from: http://genie.sis.pitt.edu/

The Problem domain for which you have to develop a Bayesian network you have to select yourself. (Bonus marks for selection of good dataset). You can get the dataset from: http://www.cs.huji.ac.il/site/labs/compbio/Repository/networks.html

Or
http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-825-techniques-in-artificial-intelligence-sma-5504-fall-2002/assignments/dataA.txt

Or any other dataset of your choice.

Submission Instructions:
* Form group of four (Maintain the same grouping as that of the previous).
* Put all your source file, exe file, and a readme.txt giving details about people involved in the group into a compressed folder named as the ID number of anyone from the group.
* Submission mode: Pl. submit through **CMS**
* For any queries related to assignment drop mails to **h2104103023@hyderabad.bits-pilani.ac.in.**
* You may use any language (or APIs) of your choice to implement these three problems. Also, the associated data structures are left to you to decide.
* The weightage for Q.1 is 5 Marks, Q.2 is 7 Marks, and Q.3 is 6 Marks.