ALLAMA IQBAL OPEN UNIVERSITY, ISLAMABAD
(Department of Computer Science)

Course: Artificial Intelligence (3451) **Semester: Spring, 2014**
Level: BS (CS) **Total Marks: 100**
 Pass Marks: 50

ASSIGNMENT No. 1
(Units: 1–4)

Note: All questions are compulsory. Each question carries equal marks.

Q. 1 Describe the following terms with suitable examples.
   a) Hill Climbing
   b) State Transition Diagram
   c) Heuristic Continuation and Dynamic Programming Searches

Q. 2 a) How programs are defined in Lisp? Explain with the help of examples.
   b) Explain with examples the scope of variables and debugging in the context of Lisp.

Q. 3 a) What is artificial intelligence? How it can be beneficial for decision making?
   b) Discuss the applications of artificial intelligence in real world with suitable examples.

Q. 4 Briefly discuss the following search techniques.
   a) Best first search
   b) A* search
   c) Beam

Q. 5 Differentiate between
   a) Forward and backward chaining
   b) Syntax and Semantics
   c) Logic Agents and Reflex Agents

1

ASSIGNMENT No. 2
(Units: 5–8)

Total Marks: 100   **Pass Marks: 50**

Q. 1 a)   What is the difference between prepositional and predicate logic.
       b)   Discuss in detail the structure ambiguity in natural language.

Q. 2 Write detail note on following:
       (a)   Learning in problem solving
       (b)   Classification of learning strategies

Q. 3 (a)   What are the major problems of knowledge representation?
       (b)   Differentiate between selection and projection.

Q. 4 (a)   What are the major approaches to semantic nets?
       (b)   Discuss the applications of speech recognition in detail.

Q. 5 Explain in detail the use of knowledge engineering for planning.

3451 Artificial Intelligence   Credit Hours: 3 (3+0)

Recommended Book:
Artificial Intelligence: A Modern Approach by Russel & Norving

Course Outlines:
Unit No. 1 Artificial Intelligence and Intelligent Agents

Introduction, Intelligence Defined, Aspects of Human Intelligence, Artificial Intelligence as a Discipline, Purpose, Uses and Applications of A.I in Manufacturing, Medicine, Defense, Chemistry, and other Applied Disciplines, Tools and Techniques used in A.I, Intelligent Agents, Structure of Intelligent Agents.

Unit No. 2 Search

Search Theory, Formulating Problems, solving Problems, finding Paths, Avoiding Repeated States, State Transition Diagram, Constraint Satisfaction, Depth First, Breadth first, Hill Climbing, Beam Search, Best First Search, Alpha-Beta Search, A * Search, Branch and Bound, Heuristic Pruning, Heuristic Continuation and Dynamic Programming Searches.

Unit No. 3 Programming Practice

Introduction to Lisp, Defining Programs, Basic Flow of Control, Basic Debugging, Recursions, The for Function, Scope of Variables, Local Variables, Building up List Structure.

Unit No. 4 Logic & Deduction

Logic Defined, syntax and Semantics, Extensions and Notational Variations, Using first Order Logic, Logic Agents, Reflex Agent, goal Based Agents, Indexing, Retrieval, and Unification, Theorem Provers, Forward and Backward Chaining, Forward and Backward Chaining algorithms, Frame Systems and Semantic Networks, Forward-Chaining Production Systems.

Unit No. 5 Planning

Planning Agent, Planning and Problem Solving, Planning in Situation Calculus, Basic Representation for Planning, Partial Order Planning, Partial Order Planning Algorithm, Planning with Partially Instantiated Operators, Knowledge Engineering for Planning,

Unit No. 6 Knowledge Representation

Introduction, Knowledge based System, Inheritance, Prepositional and Predicate Logic, Constraints, Knowledge Representation Using Rules, Frames, and Semantic Nets, Approaches to Semantic Nets, Production rules, Knowledge Representation and Databases Nary Relations, Selection, Projection, Joins, and Problems of Knowledge Representation.

Unit No.7 Natural Language Processing

Syntax Analysis/Parsing, Semantic Analysis, Problems, Pragmatics, Morphology, Applications of NLP, Disadvantages of NLP, Monolingual, Bilingual, Multilingual, Structure Ambiguity in Natural Language, Discourse Understanding, Discourse Boundaries
Speech Recognition: Structure, Advantages, Applications of Speech Recognition, Problems of Speech Recognition

Unit No. 8 Learning

Introduction, Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples (Induction), Learning from Observations, Explanation Based Learning, Learning by Experience,
Machine Learning: Introduction, Methods of Learning, classification of Learning Strategies, Components of Machine Learning System, Limitation in terms of Speed.

Unit No. 9 Expert Systems (ES)

Nature of Expert Systems, Features and Characteristics of Expert Systems, Structure of Expert Systems/Components, Roles Involved in building ES, Difference between Expert systems and Conventional Computer Programs, Expert System Applications, Limitations of Expert Systems, Introduction & Types of Robots, Classifications and Characteristics of Robots.

Note: Students/groups shall be given simple problems at different points to understand and apply AI techniques learned in particular unit. A teacher may take a simple problem and carry it over to clarify the concept throughout the course. Students/groups shall be given additional home problems to practice during open lab at home.

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