

SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)
SRM Nagar, Kattankulathur – 603 203.



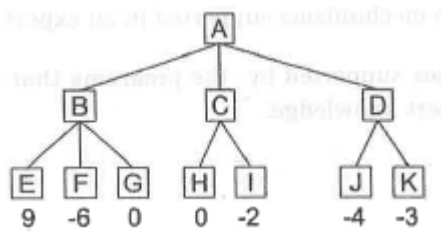
DEPARTMENT OF INFORMATION TECHNOLOGY QUESTION BANK

SUBJECT : IT8601 - Computational Intelligence

SEM / YEAR: VI Sem/ III Year

UNIT I INTRODUCTION			
Introduction to Artificial Intelligence-Search-Heuristic Search-A* algorithm-Game Playing- Alpha-Beta Pruning-Expert systems-Inference-Rules-Forward Chaining and Backward Chaining- Genetic Algorithms			
PART – A			
Q.No.	Questions	BT Level	Competence
1	Define Artificial Intelligence.	BTL1	Remembering
2	List the criteria to measure the performance of different search strategies.	BTL1	Remembering
3	Describe the four categories under which AI is classified.	BTL1	Remembering
4	What are Expert Systems?	BTL1	Remembering
5	List the characteristic features of expert system.	BTL1	Remembering
6	Define Inference.	BTL1	Remembering
7	Infer some of the application domain where the agent based problem solving is appropriate.	BTL2	Understanding
8	Give any four names of earliest expert systems.	BTL2	Understanding
9	Infer some of the uninformed search techniques.	BTL2	Understanding
10	Give the components of Game software.	BTL2	Understanding
11	Write the general form of the genetic algorithm	BTL3	Applying
12	Show the definition of state-space search technique.	BTL3	Applying
13	Show the meaning of heuristic search.	BTL3	Applying
14	Compare Informed & Uninformed search with examples.	BTL4	Analyzing
15	Will Breadth-First Search always find the minimal solution why?	BTL4	Analyzing
16	State the Point of view of alpha-beta pruning.	BTL4	Analyzing
17	Appraise when hill climbing fails to find a solution?	BTL5	Evaluating
18	Assess the forward chaining rules with example.	BTL5	Evaluating
19	Name the three activities supported by the programs that interact with domain experts to extract expert knowledge.	BTL6	Creating
20	Write the ways to formulate a problem.	BTL6	Creating
PART – B			
1	Describe informed search strategies with an example. (13)	BTL1	Remembering
2	List the advantages and limitations of Genetic Algorithm. State the taxonomy of the crossover operator. (13)	BTL1	Remembering
3	Define A* search algorithm. Discuss about the admissibility of A* algorithm. (13)	BTL1	Remembering
4	List and describe the problem characteristics that need to be considered for selecting appropriate heuristics for a given class of problems. (13)	BTL1	Remembering
5	(i) Distinguish A* and AO * algorithm with each other. (6)	BTL2	Understanding

	(ii) Demonstrate why some times unnecessary backward propagation occurs in AND OR graph. (7)		
6	Infer in details about Rule Based Systems with some examples. (13)	BTL2	Understanding
7	i. Give the characteristics of AI problems? Explain with example (7) ii. Express what is Control Strategy and Production System? How this is helpful in AI (6)	BTL2	Understanding
8	Write short notes on Expert system tools and expert system shell. (13)	BTL3	Applying
9	How is AI useful in game playing techniques. Describe what is adversarial search? (13)	BTL3	Applying
10	i. Illustrate the role of knowledge engineer, domain expert and an end user in an expert system. (6) ii. Explain the difficulties involved in developing an expert system. (7)	BTL3	Applying
11	Point out the procedures of genetic algorithms and what are the different genetic representations	BTL4	Analyzing
12	(i) Infer what is alpha beta pruning / search. (7) (ii) Explain MINIMAX search technique / algorithm with an example. (6)	BTL4	Analyzing
13	Draw the state space graph of Hill climbing search. What are the draw backs of this algorithm? Also discuss about time space complexity of this algorithm (13)	BTL5	Evaluating
14	<p>Consider the block world problem with four blocks A,B,C,D with the start and goal states given below,</p> <div style="text-align: center;"> <p>Start Goal</p> <p style="margin-left: 100px;">A D C B</p> <p style="margin-left: 100px;">D C B A</p> <p>Blocks World</p> </div> <p>Assume the following two operations: Pick and a block and put it on table, pick up a block and put it on another block. Solve the above problem using Hill Climbing algorithm and a suitable heuristic function. Show the intermediate decisions and states. (13)</p>	BTL6	Creating
PART – C			
1	Is it advisable to apply GA's for all kinds optimization problems? Justify. (15)	BTL5	Evaluating
2	Solve the given problem. Describe the operators involved in it. Consider a Water jug Problem: You are given two jugs, a 4-gallon one and a 3-gallon one. Neither has any measuring markers on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 gallons of water into the 4-gallon jug?	BTL6	Creating

	Explicit Assumptions: A jug can be filled from the pump, water can be poured out of a jug onto the ground, water can be poured from one jug to another and that there are no other measuring devices available. (15)		
3	<p>Consider a two player game in which the minimax search procedure is used to compute the best moves for the first player. Assume a static evaluation function that returns values ranging from -10 to 10, with 10 indicating a win for the first player and -10 a win for the second player. Assume the following game tree in which the static scores are from the first player 's point of view. Suppose the first player is the maximizing player and needs to make the next move. What move should be chosen at this point? Can the search be optimized? (15)</p> 	BTL6	Creating
4	<p>Assess the following types of hill climbing search techniques</p> <ol style="list-style-type: none"> i) Simple hill climbing(5) ii) Steepest- Ascent Hill climbing(5) iii) Simulated Annealing(5) 	BTL5	Evaluating

UNIT II KNOWLEDGE REPRESENTATION AND REASONING			
Proposition Logic - First Order Predicate Logic – Unification – Forward Chaining -Backward Chaining - Resolution – Knowledge Representation - Ontological Engineering - Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information - Prolog Programming			
PART – A			
Q.No.	Questions	BT Level	Competence
1	Identify how predicate logic is helpful in knowledge representation.	BTL1	Remembering
2	Define unification.	BTL1	Remembering
3	Define Ontology.	BTL1	Remembering
4	List the predicates of time intervals.	BTL1	Remembering
5	What is independent axiom.	BTL1	Remembering
6	List the names of logical agents for wumpus world problem.	BTL1	Remembering
7	Give the expansion of LISP and PROLOG.	BTL2	Understanding
8	Infer FOL with an example.	BTL2	Understanding
9	State in your own words about uniqueness quantifier.	BTL2	Understanding
10	Can you write a brief outline about daunting.	BTL2	Understanding
11	Differentiate propositional logic and predicate logic.	BTL3	Applying
12	Differentiate declarative and procedural knowledge.	BTL3	Applying
13	Show what is the problem that the effect of axiom say.	BTL3	Applying

14	Analyze the definition of logic.	BTL4	Analyzing
15	Analyze the time and event calculus.	BTL4	Analyzing
16	Analyze the following in a predicate logic: For all x and y, if x is a parent of y then y is a child of x.	BTL4	Analyzing
17	Identify the relationship between agents and mental objects.	BTL5	Evaluating
18	Assess the chances for representing categories in first-order logic.	BTL5	Evaluating
19	For the given sentence “All Pompeian’s were Romans” write a well formed formula in predicate logic.	BTL6	Creating
20	Convert the following into Horn Clauses. $\forall x:\forall y:\text{cat}(x) \vee \text{fish}(y) \rightarrow \text{likes} - \text{to} - \text{eat}(x,y)$	BTL6	Creating
PART – B			
1	Describe briefly about Ontological Engineering. (13)	BTL1	Remembering
2	Define the term logic. What is the role of logic in Artificial Intelligence? Compare Propositional logic with First order logic (Predicate Calculus). (13)	BTL1	Remembering
3	Describe Unification algorithm in brief with an example. (13)	BTL1	Remembering
4	Label how to convert English to prolog facts using facts and rules. (13)	BTL1	Remembering
5	Classify the steps needed for Knowledge engineering Process in predicate logic. (13)	BTL2	Understanding
6	Illustrate how to create more general and flexible representations in Ontological engineering. (13)	BTL2	Understanding
7	Infer the ontology for situation calculus.(13)	BTL2	Understanding
8	Explain how categories and objects are presented in any four sets. (13)	BTL3	Applying
9	i. What is resolution Principle in propositional logic, explain? (7) ii. Let the following set of axioms is given to be true: $P, (P \wedge Q) \rightarrow R, (S \vee T) \rightarrow Q, T$. Assumption is that all are true. To Prove that R is true (6)	BTL3	Applying
10	Explain Backward and forward Chaining, with example in logic representation. Also mention advantages and disadvantages of both the algorithms. (13)	BTL3	Applying
11	Explain briefly about the characteristics of a prolog programming. (13)	BTL4	Analyzing
12	How is resolution in first order predicate logic different from that of propositional performed? What is Unification Algorithm & why it is required?	BTL4	Analyzing
13	Trace the operations of the unification algorithm on each of the following pairs of literals: i) $f(\text{Marcus})$ and $f(\text{Caesar})$ (3) ii) $f(x)$ and $f(g(y))$ (5) iii) $f(\text{Marcus}, g(x,y))$ and $f(x, g(\text{Caesar}, \text{Marcus}))$ (5)	BTL5	Evaluating
14	Convert the following well formed formula into clause form with sequence of steps: (13) $\forall x: [\text{Roman}(x) \wedge \text{Know}(x,\text{Marcus})] \rightarrow [\text{hate}(x, \text{Caesar}) \vee (\forall y: \exists z: \text{hate}(y,z) \rightarrow \text{think crazy}(x,y))]$	BTL6	Creating

PART – C			
1	<p>Consider the following sentences:</p> <ul style="list-style-type: none"> • John likes all kinds of food • Apples are food • Chicken is food • Anything anyone eats and isn't killed by is food • Bill eats peanuts and is still alive • Sue eats everything Bill eats <p>i) Translate these sentences into formulas in predicate logic(7) ii) Convert the formulas of part a into clause form.(8)</p>	BTL6	Creating
2	<p>Evaluate the unification algorithm used for reasoning under predicate logic with an example. Consider the following facts. (15)</p> <p>a. Team India b. Team Australia c. Final match between India and Australia d. India scored 350 runs, Australia scored 350 runs, India lost 5 wickets, Australia lost 7 wickets. e. The team which scored the maximum runs wins. f. If the scores are same the team which lost minimum wickets wins the match.</p> <p>Represent the facts in predicate, convert to clause form and prove by resolution “India wins the match”.</p>	BTL5	Evaluating
3	<p>i. Why we use prolog programming language? (5) ii. Write a sample program in prolog language?(6) iii. Criticize how prolog language can be stated as procedural language?(4)</p>	BTL5	Evaluating
4	<p>Convert the following sentences to wff in first order predicate logic. (15)</p> <p>(i) No coat is water proof unless it has been specially treated. (ii) A drunker is enemy of himself. (iii) Any teacher is better than a lawyer. (iv) If x and y are both greater than zero, so is the product of x and y. (v) Every one in the purchasing department over 30 years is married.</p>	BTL6	Creating

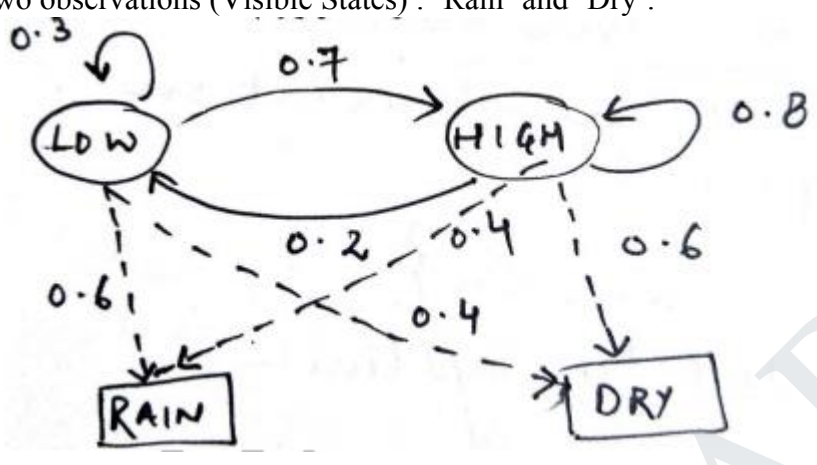
UNIT III UNCERTAINTY			
Non monotonic reasoning-Fuzzy Logic-Fuzzy rules-fuzzy inference-Temporal Logic-Temporal Reasoning-Neural Networks-Neuro-fuzzy Inference			
PART – A			
Q.No.	Questions	BT Level	Competence
1	Define Neural Networks	BTL1	Remembering
2	What is Fuzzy Logic? What is its use?	BTL1	Remembering
3	Define non monotonic reasoning.	BTL1	Remembering
4	List the Application of neural networks	BTL1	Remembering
5	What are the ways in which one can understand the semantics of a belief network?	BTL1	Remembering

6	What are the two functions in Neural network's Activation functions?	BTL1	Remembering
7	State in your own words about Hedges?	BTL2	Understanding
8	Give some example of non-monotonic reasoning.	BTL2	Understanding
9	What are the disadvantages of closed world Assumption? How will you overcome it	BTL2	Understanding
10	Express fuzzy inference.	BTL2	Understanding
11	What are the structures of neural network?	BTL3	Applying
12	Generalize single layer and multilayer feed forward neural network?	BTL3	Applying
13	Produce the main difficulties involved with the gradient descent method.	BTL3	Applying
14	Analyze the different types of FLC.	BTL4	Analyzing
15	Point out the degree of membership.	BTL4	Analyzing
16	Differentiate fuzzification and defuzzification.	BTL4	Analyzing
17	What happens if the examples are not linearly separable?	BTL5	Evaluating
18	Criticize the remarks on back propagation.	BTL5	Evaluating
19	Tell how do you think about non-monotonic reasoning is in terms of arguments.	BTL6	Creating
20	In a class of 10 students (the universal set), 3 students speaks German to some degree, namely Alice to degree 0.7, Bob to degree 1.0, Cathrine to degree 0.4. what is the size of the subset A of German speaking students in the class.	BTL6	Creating
PART – B			
1	Define Fuzzy Set? Explain in brief about Fuzzy set operations? (13)	BTL1	Remembering
2	Identify the different key issues with respect to non-monotonic reasoning system? (13)	BTL1	Remembering
3	Describe briefly about the neuro fuzzy inference in detail. (13)	BTL1	Remembering
4	Identify the list of basic structure of a generic temporal models. (13)	BTL1	Remembering
5	Classify the fuzzy rules with examples. (13)	BTL2	Understanding
6	Demonstrate fuzzy inferences from imprecise data. (13)	BTL2	Understanding
7	Interrelate the factors influencing back propagation neural network. (13)	BTL2	Understanding
8	Write a note on fuzzy logic. How do it uses for probabilistic reasoning. (13)	BTL3	Applying
9	Distinguish between single layer and multi layer perception neural networks? (13)	BTL3	Applying
10	Generalize the representations fuzzy elements. (13)	BTL3	Applying
11	Explain in brief about fuzzy propositions? (13)	BTL4	Analyzing
12	Point out the type of problems that can be solved with neural network? What are the advantages? What are the inconvenient.(13)	BTL4	Analyzing
13	Assess the Temporal Logic with Reasoning. (13)	BTL5	Evaluating
14	Write the most popular algorithm for training a neural network? What is its principle? (13)	BTL6	Creating
PART – C			
1	Assess the conventional reasoning system with non-conventional	BTL5	Evaluating

	reasoning system? (15)		
2	With the help of diagram, explain the training algorithm of Back propagation networks and discuss how the various parameters are chosen for training the neural net? (15)	BTL6	Creating
3	Explain the neuro fuzzy architecture and give some applications. (15)	BTL5	Evaluating
4	Explain fuzzy logic control with the neat diagram. (15)	BTL5	Evaluating

UNIT IV LEARNING			
Probability basics - Bayes Rule and its Applications - Bayesian Networks – Exact and Approximate Inference in Bayesian Networks - Hidden Markov Models - Forms of Learning - Supervised Learning - Learning Decision Trees – Regression and Classification with Linear Models - Artificial Neural Networks – Nonparametric Models - Support Vector Machines - Statistical Learning - Learning with Complete Data - Learning with Hidden Variables- The EM Algorithm – Reinforcement Learning			
PART – A			
Q.No.	Questions	BT Level	Competence
1	Define Bayes theorem. Give the Baye’s rule equation.	BTL1	Remembering
2	What is localization problem.	BTL1	Remembering
3	Define Artificial Neuron model.	BTL1	Remembering
4	Mention the statistical learning methods.	BTL1	Remembering
5	What is HMM.	BTL1	Remembering
6	Define EM algorithm.	BTL1	Remembering
7	State in your own words about conditional probability.	BTL2	Understanding
8	Infer what is Reward Function in Reinforcement learning ?	BTL2	Understanding
9	Give the different forms of learning.	BTL2	Understanding
10	State the support vector in SVM?	BTL2	Understanding
11	Generalize the categories of neural network structures?	BTL3	Applying
12	Distinguish between full joint probability distribution and joint probability distribution.	BTL3	Applying
13	Organize the key features of reinforcement learning.	BTL3	Applying
14	Organize the types of learning.	BTL4	Analyzing
15	Difference between Classification and Regression.	BTL4	Analyzing
16	Identify the issues that affect the design of an learning element.	BTL4	Analyzing
17	Assess Bayesian networks with an example.	BTL5	Evaluating
18	Write some applications of Supervised Learning.	BTL5	Evaluating
19	Given that $P(A)=0.3, P(A B)=0.4$ and $P(B)=0.5$, compute $P(B A)$.	BTL6	Creating
20	Draw the state transition diagram for Markov system.	BTL6	Creating
PART – B			
1	Describe Hidden Markov Model and its applications in AI. (13)	BTL1	Remembering
2	Define EM algorithm and explain the general form of EM algorithm. (13)	BTL1	Remembering
3	Describe briefly about the Regression and Classification with Linear Models. (13)	BTL1	Remembering
4	Identify Various Types of Reinforcement Learning Techniques. (13)	BTL1	Remembering
5	Distinguish between Supervised Learning and Unsupervised	BTL2	Understanding

	Learning. Also mention some of the application areas of both. (13)		
6	Express the statistical Learning with examples. (13)	BTL2	Understanding
7	Describe briefly about (i) Continuous model for Maximum likelihood Estimation (6) (ii) Learning with Hidden Variables. (7)	BTL2	Understanding
8	Marie's marriage is tomorrow <ul style="list-style-type: none"> • In recent years , each year it has rained only 5 days • The weatherman has predicted rain tomorrow • When it actually rains the weatherman correctly forecasts rain 90% of the time • When it doesn't rain, the weatherman incorrectly forecasts rain 10% of time. What is the probability that it will rain on the day of Marie's wedding? (13)	BTL3	Applying
9	Generalize Support Vector Machines in detail. What are advantages and disadvantages of SVM. (13)	BTL3	Applying
10	Tell briefly about the Decision Tree Learning? Why it is useful in AI applications? (13)	BTL3	Applying
11	i. Explain ANN and Artificial neuron. (6) ii. What is feed forward neural network. (7)	BTL4	Analyzing
12	What is learning with complete data? Explain Maximum Likelihood Parameter Learning with Discrete Model in detail. (13)	BTL4	Analyzing
13	Can linear regression be used for classification? Justify. (13)	BTL5	Evaluating
14	What is the maximum number of edges in a Bayesian network (BN) with n nodes? Prove that a valid BN containing this number of edges can be constructed (remember that the structure of a BN has to be a Directed Acyclic Graph). (13)	BTL6	Creating
PART – C			
1	Construct the Bayesian network and define the necessary CPTs for the given scenario we have a bag of three biased coins a, b and c with probabilities of coming up heads of 20%, 60% and 80% respectively. One coin is drawn randomly from the bag (with equal likelihood of drawing each of the three coins) and then the coin is flipped three times to generate the outcomes X1, X2 and X3. (15)	BTL4	Analyzing
2	The following table consists of training data from an employee database. The data have been generalized. Let status be the class label attribute. Construct Decision tree from the given data. (15) Department Age Salary Count Status Sales 31...35 46k..50k 30 Senior Sales 26...30 26k..30k 40 Junior Sales 31...35 31k..35k 40 Junior Systems 21...25 46k..50k 20 Junior Systems 31...35 66k..70k 5 Senior Systems 26...30 46k..50k 3 Junior Systems 41...35 66k..70k 3 Senior Marketing 36...40 46k..50k 10 Senior Marketing 31...35 41k..45k 4 Junior	BTL5	Evaluating

	Secretary 46...50 36k..40k 4 Senior Secretary 26...30 26k..30k 6 Junior		
3	<p>Consider the following data provided for Weather Forecasting Scenario. (15) Two states (Hidden) : 'Low' and 'High' atmospheric pressure. Two observations (Visible States) : 'Rain' and 'Dry'.</p> 	BTL6	Creating
4	Point out Reinforcement learning technique in detail .Also Mention its applications in the field of Artificial intelligence. (15)	BTL4	Analyzing

UNIT V INTELLIGENCE AND APPLICATIONS

Natural language processing-Morphological Analysis-Syntax analysis-Semantic Analysis-All applications – Language Models - Information Retrieval – Information Extraction - Machine Translation – Machine Learning - Symbol-Based – Machine Learning: Connectionist – Machine Learning

PART – A

Q.No.	Questions	BT Level	Competence
1	Define CFG.	BTL1	Remembering
2	Define NLP.	BTL1	Remembering
3	State Morphology.	BTL1	Remembering
4	Label the terminologies are available in NLP?	BTL1	Remembering
5	What is nouns and give example for nouns.	BTL1	Remembering
6	List out the advantages of NLP.	BTL1	Remembering
7	Give the merits and demerits of context free grammars.	BTL2	Understanding
8	Identify the components of Natural language processing.	BTL2	Understanding
9	Infer parse tree and give example.	BTL2	Understanding
10	Express adjectives with examples.	BTL2	Understanding
11	Sketch the basic definition of top down parse.	BTL3	Applying
12	Show how would you differentiate Machine Translation and Learning?	BTL3	Applying
13	Prepare how mapping works in NLP?	BTL3	Applying
14	Analyze why is NLP difficult?	BTL4	Analyzing
15	Differentiate syntax and semantic analysis in NLP terminologies.	BTL4	Analyzing
16	Point out the advantages and disadvantages of top down parser.	BTL4	Analyzing

17	Appraise the name of application in NLP?	BTL5	Evaluating
18	Assess information retrieval process in the applications of NLP.	BTL5	Evaluating
19	Tell about language models in the applications of NLP.	BTL6	Creating
20	Write about symbol based application in intelligence.	BTL6	Creating
PART – B			
1	List the Steps in Natural Language Processing and explain them with some examples. (13)	BTL1	Remembering
2	Describe the categories involved in Information Retrieval system. (13)	BTL1	Remembering
3	Describe the structure of NLU and its difficulties. (13)	BTL1	Remembering
4	Describe about NLP? Write in details about various application of NLP. (13)	BTL1	Remembering
5	Express the basic concept of Machine Translation System with a schematic diagram. (13)	BTL2	Understanding
6	Discuss the concept of Computer Intelligence and its application. (13)	BTL2	Understanding
7	i. Illustrate probabilistic models for information extraction (7) ii. Express conditional random fields for information extraction (6)	BTL2	Understanding
8	Explain briefly on implementation aspects of syntactic analysis. (13)	BTL3	Applying
9	Write shot notes on Page Rank algorithm and HITS Algorithm. (13)	BTL3	Applying
10	Write short notes on i. Phonology (2) ii. Morphology (2) iii. Discourse (2) iv. Semantics (3) v. Syntax (4)	BTL3	Applying
11	Identify about the application of natural language processing. (13)	BTL4	Analyzing
12	Compare the machine learning and machine translation application of NLP. (13)	BTL4	Analyzing
13	Evaluate whether an IR system is performing well? (13)	BTL5	Evaluating
14	Organize how phrase structure ambiguity affects NLP? Illustrate possible phrase structures for the sentence: "John saw the man on the mountain with a telescope". (13)	BTL6	Creating
PART – C			
1	Point out the importance of syntax and semantics in NLP. Construct a grammar and draw the parse tree for the sentence "Bill Printed the file". (15)	BTL4	Analyzing
2	Case study: Find the algorithm that is capable of learning to recognize the handwritten digits and squeezing every last drop of predictive performance out of them. (15)	BTL6	Creating
3	What is Natural language processing? Mention its application domain in AI. What are some of the problems which arise in natural language understanding for autonomous machines like robots, intelligent computers. (15)	BTL4	Analyzing
4	Analyze the structure and research models involved in machine translation. (15)	BTL4	Analyzing

