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NED UNIVERSITY OF ENGINEERING & TECHNOLOGY, KARACHI
FINAL YEAR (COMPUTER SCIENCE AND INFORMATION TECHNOLOGY)
ANNUAL EXAMINATION 2007
BATCH 2003-04

Time: 3 Hours

Dated: 02-11-2007
Max. Marks: 80

EXPERT SYSTEMS & KNOWLEDGE ENGINEERING
(CT-453)

Instructions: Attempt any *five* questions

All questions carry equal marks

Avoid unnecessary details.

- Q.1
- (i) What are ANN's? Discuss briefly the functionality of a single input neuron. Draw the diagram with proper labeling. (3 marks)
 - (ii) Define the following: (3 marks)
 - (i) Artificial Intelligence
 - (ii) Perfect Intelligence
 - (iii) Intelligence
 - (iii) Given a two input neuron with the following weight matrix and Input vector $W=[3 \ 2]$ & $P=[-5 \ 7]^T$ (8 marks)
We would like to have an output of 0.5. Do you suppose that there is a combination of bias and transfer function that might allow this:
 - a) Is there a transfer function that will do the job if the bias is zero?
 - b) Is there a bias that will do the job if the linear transfer function is used? If "yes" what is it?
 - c) Is there a bias that will do the job if the Log-Sigmoid transfer function is used? If "yes" what is it?
 - d) Is there a bias that will do the job if the Hard Limit transfer function is used? If "yes" what is it?
 - (iv) Briefly define supervised and unsupervised learning algorithms. (2 marks)
- Q.2
- (i) List three capabilities of ES. (3 marks)
 - (ii) A major difference between a conventional decision support system and ES is that the former can explain a "how" question where as the latter can explain a "why" question. Discuss (3 marks)
 - (iii) Draw the diagram for the 'Structure' of an Expert System. Briefly define Inference Engine. (5 marks)
 - (iv) A knowledge base includes facts and rules. Explain the difference between the two. (2 marks)
 - (v) Define the following: (3 marks)
 - (i) Expert
 - (ii) Expertise
 - (iii) Transferring Expertise
- Q.3
- (i) Define Knowledge Engineering (2 marks)
 - (ii) Discuss the major tasks performed by the knowledge engineer (3 marks)

- (iii) What is knowledge acquisition? Why it is considered as the most difficult step in knowledge engineering? **(5 marks)**
- (iv) Compare declarative and procedural knowledge. **(4 marks)**
- (v) Briefly discuss two deficiencies of manual knowledge acquisition. **(2 marks)**

- Q.4**
- (i) Compare and contrast semantic and episodic knowledge. **(4 marks)**
 - (ii) What is repertory grid analysis? What are its major weaknesses? **(3 marks)**
 - (iii) Compare and contrast structured and unstructured interviews. **(3 marks)**
 - (iv) Examination of admission records of Atlanta University showed the admission cases in following table: **(6 marks)**

Case No.	GMAT	GPA	Decision
1	510	3.5	Yes
2	620	3.0	Yes
3	580	3.0	No
4	450	3.5	No
5	655	2.5	Yes

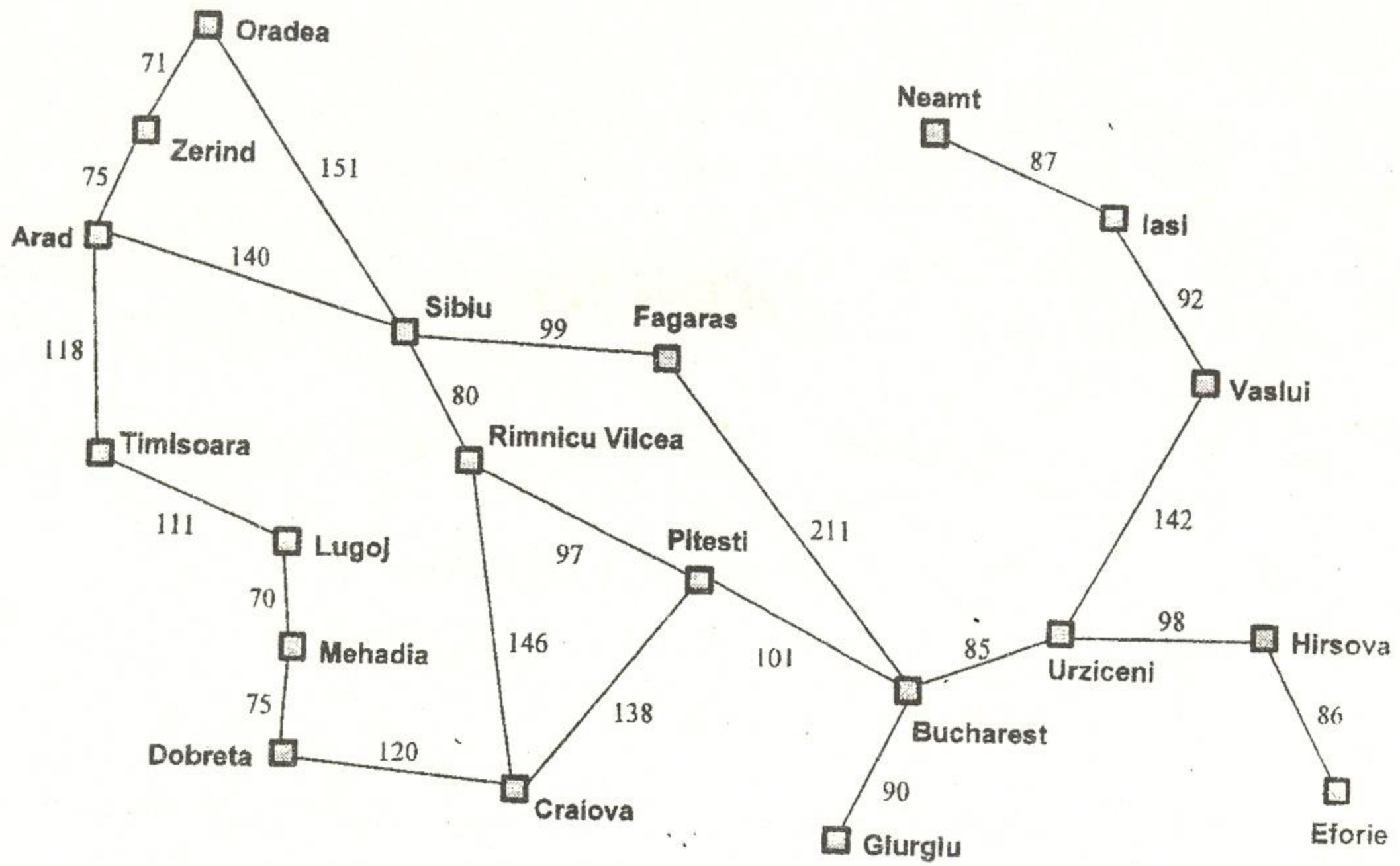
- a. Assume that admission decisions are based on only on the scores of GMAT and GPA. Find, by induction, the rules used. Subject all five cases to the rules generated; make sure they are consistent with the rules.
- b. Assume that only two rules were used. Identify these rules?

- Q.5**
- (i) Given the following two sets of statements and conclusions, what type of reasoning was used to arrive at the conclusions? **(4 marks)**
 - a. Students that do not study do not pass exams.
Nancy is a student.
Nancy did not study.
Conclusion: Nancy will not pass her exam.
 - b. Jack did not study for the exam.
Jack is a student.
Jack did not pass the exam.
Conclusion: Students, who do not study, do not pass exams.

- (ii) You are given an expert system with the following rules: **(6 marks)**
 - R1: IF interest rate falls
THEN bond prices increase
 - R2: IF interest rate increases
THEN bond prices decline
 - R3: IF interest rate is unchanged
THEN bond prices remain unchanged
 - R4: IF the dollar rises(against other currencies)
THEN interest rate declines
 - R5: IF the dollar falls
THEN interest rate increases
 - R6: IF bond prices decline
THEN buy bonds

A client just observed that the dollar exchange rate is falling. He wants to know whether to buy bonds. Run a forward and a backward chaining and submit a report to him.

- (iii) Define backward chaining and contrast it with forward chaining. (3 marks)
- (iv) Compare modus ponens with modus tollens. Why is former used more? (3 marks)
- Q.6**
- (i) What do we mean by knowledge representation? List the major knowledge representation methods. (3 marks)
- (ii) Let p and q be the propositions (4 marks)
- p : Your car is out of gas.
 q : You can't drive your car.
- Write the following propositions using p and q and logical connectives.
- a) Your car is not out of gas.
b) You can't drive your car if it is out of gas.
c) Your car is not out of gas if you can drive it.
d) If you can't drive your car then it is out of gas.
- (iii) Develop a script about shopping in a super market. (5 marks)
- (iv) Construct a semantic network for the following situation: (4 marks)
Mini is a robin; it lives in a nest which is on a pine tree in Ms. Wang's backyard. Robins are birds, they can fly and they have wings. They are an endangered species and they are protected by government regulations.
- Q.7**
- (i) Define a robot. What are the three main justifications for using robots instead of humans? (4 marks)
- (ii) Explain androids and cyborgs. (4 marks)
- (iii) If robots are so wonderful, why don't we see more of them around us? (3 marks)
- (iv) What is the function of the controller? (2 marks)
- (v) List the type of senses used in robotics and define the functionality of "Touch sense". (3 marks)
- Q.8**
- (i) Give two definitions of heuristics. (4 marks)
- (ii) What are the drawbacks of Hill Climbing Search? (4 marks)
- (iii) Show the search tree that would be generated by Greedy Best-first search trying to find the shortest path from Craiova to Bucharest. Assume that $f(n)$ = the straight-line distance of n 's city to Bucharest. Show the order in which the nodes would be generated and examined. Indicate the $f(n)$ for each node that was generated and the state for each node. (8 marks)



Strait-line distance to Bucharest:

Arad	366	Neamt	234
Bucharest	0	Oradea	380
Craiova	160	Pitesti	98
Dobreta	242	Rimnicu	193
Eforie	161	Sibiu	253
Fagaras	178	Timisoara	329
Giurgiu	77	Urziceni	80
Hirsova	151	Vaslui	199
Iasi	226	Zerind	374
Lugoj	244		
Mehadia	241		

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-----BEST OF LUCK-----