

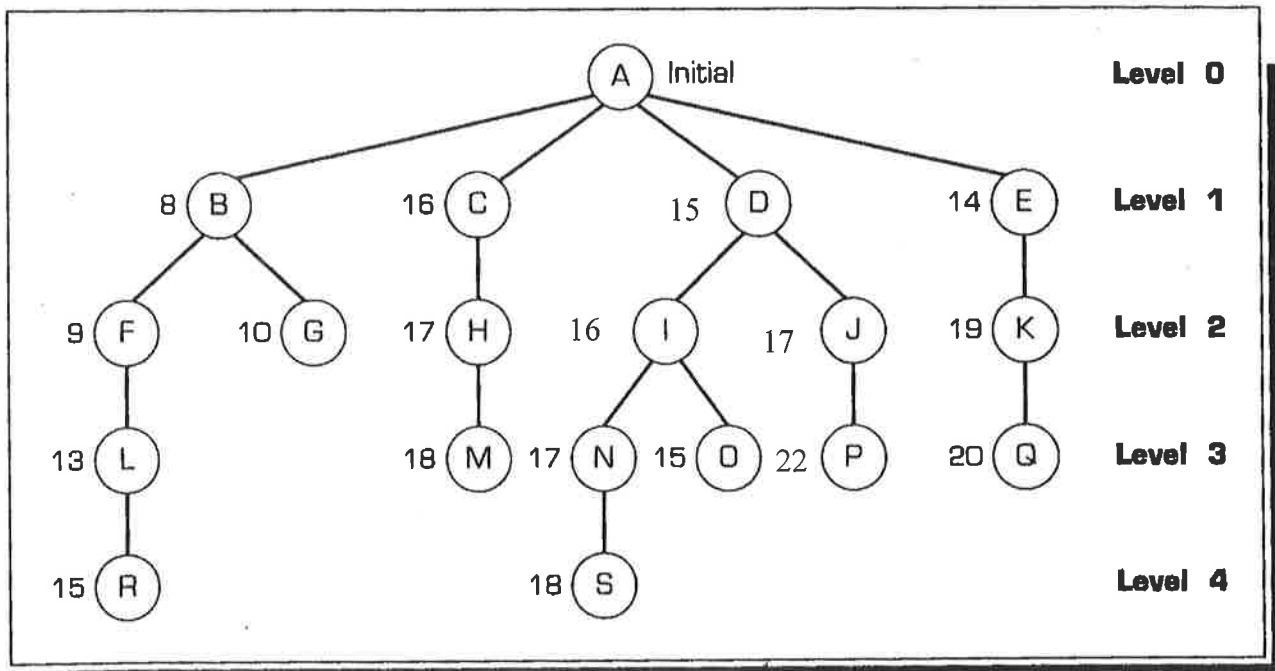
國立交通大學 102 學年度第 2 學期 博士班資格考筆試考試試題

土木工程學系 資訊組(己) 科目：人工智慧在土木工程之應用 選考學生數：1 考試時間：60 min

第 1 頁，共 2 頁

注意：請選其中三題作答！

1. Study the search tree given here. The numbers above the nodes illustrate the profit associated with a project designated by the specific nodes. The goal is to find a project with a value of twenty or higher.
 - (b) Use a depth-first approach to identify the node.
 - (c) Use a hill-climbing approach to identify the node.
 - (d) Use the best-first (A*) approach to solve the problem.



2. In artificial neural networks (ANN), error back-propagation (BP) is one of important learning models.
 - (a) Please present the flowchart of error back-propagation (BP) learning algorithm.
 - (b) What is the main function for momentum term in conventional BP algorithm?
 - (c) What is the drawback for the constant learning ratio in BP?
 - (d) Can we normalize the inputs and outputs in the interval of $[0, 1]$ as the sigmoid function $1/(1+e^{-x})$ is utilized? Why?
 - (d) Please derive the $\Delta w_{kj} = -\mu \frac{\partial E(W)}{\partial w_{kj}}$ for weights between output layer and hidden layer. Here, system error is defined as

$$E = \frac{1}{2P} \sum_{p=1}^P (d_p - o_p)^2$$

where P is number of training instances. d_p and o_p are the desired and computed output for the p th training instance.

3. Given the following fuzzy rules:

R1: If (E1=*very high*) and (E=*high*) Then (H1)

R2: If (E2=*very high*) and (E=*low*) Then (H2)

R3: If (E2=*a little low*) Then H3

R4: If (E3=*high*) Then H3

Assume that the membership value for membership function is defined as

high $\mu_{high}(x) = S(x : 0, 0.5, 1.0)$

low $\mu_{low}(x) = \sim \mu_{high}(x)$

very high $\mu_{very\ high}(x) = \mu_{high}(x)^2$

a little low $\mu_{a\ little\ low}(x) = \mu_{low}(x)^{0.5}$

somewhat
$$\begin{cases} \mu(x) = S(x : 0, 0.25, 0.5) & x < 0.5 \\ \mu(x) = 1 - S(x : 0.5, 0.75, 1.0) & x \geq 0.5 \end{cases}$$

By given

E = *high* E1 = *low* E2 = *somewhat* E3 = 0.8

Please calculate the results of H1, H2 and H3.

4. Describe the procedure of *production system* (生產系統) and list at least four rules of conflict resolution (衝突解決)
5. What are the differences between expert system and conventional program.