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- Question 1
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- Question 5

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Qtext:-

[3+4 = 7 Marks]

"A software intern is always trained in a project as a project member. Every Project member is involved in development team and support team. Every development member is involved in unit testing. Every support member is involved in user acceptance testing. A project member trained in both unit testing and acceptance testing is certified as skilled in testing."

a. Convert the above into predicate logic. **Note:** Clearly define your own predicate designs and use only predicates with binary arguments. **Tip:** If required, you may introduce no more than 2 implicit predicates/rules w.r.t to given facts/scenario.

b. Prove by backward chaining that "*Prove that all the software interns will be certified as skilled in testing.*" using the results of part a. Show the steps by step inferences using neat diagram with direction.
Tip: Derived facts from applying implicit rules help in the chaining.


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Qtext:-

[2+5+2= 9 Marks]

Suppose the assumptions of markov model is applicable in the sequence prediction, to detect the unfair practices by the tax payers by the income tax department in below example, answer the following questions.

"Observation of the tax payer's payments & proofs in consecutive financial year depicted that those who pay correctly tax without fail submit their fund payment proof with 0.6 probability and show the loan proof with 0.4 probability. Alarmingly 70% of time the proof of investment submitted include medical claims among those who evade tax. 20% of the correct tax payers seem to evade tax in the following financial year and 35% of such evaders continue to evade tax again in next financial year. Among those who evade tax by any unfair means, 15% of time proof of investments prominently include fund payment and other 15% of such scenarios include loan proof."

a. Construct the Markov Model by extracting the transition and emission probability matrices from above pattern. Depict them with neat diagrams in addition to tabular representation. Assume equal likelihood for initial state.
b. For the below observations in the three consecutive financial year, predict if the tax payer correctly paid tax or not in the second financial year. Strictly follow the approach as discussed in class only.

(fund, Medical, fund)

c. Explain with appropriate situations in reference to the given problem only, where Viterbi algorithm is applicable. Frame suitable problem statement for the same. No need to solve the problem.

Question 1

Question 2

Question 3

Question 4

Question 5

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Qtext:-

Consider the below Bayesian Network and answer the following questions:

[3+2+3=8 Marks]

a. Extract & construct the Bayesian network diagram to depict the exact pattern observed from below historical guest faculty records in BITS WILP program. Show the completely filled conditional probability table along with the diagram and list any one correct linearization of the variables from the net. **Note**: Use the bolded variables for solution and the complementary state for variables can be represented with ~ propositional symbol. eg., Not a Variable-X **(X)** can be represented as ~**X**.

Observation:

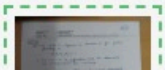
*Its observed that 80% of the doctorate registration**(D)** in BITS do not belong to alumnus**(A)** of BITS WILP and only 50% of the doctorate registrations are from alumnus. In order to approve a guest faculty**(G)** applicant, a process is in place checks if the applicant has doctorate registration and/or in collaboration with software industry**(F)**. Observation is that there is 80% chance in approval if the person is associated with both and only 10% chance if not associated in any. With 0.95 probability a member of government research comes from BITS alumnus. Among the guest faculty historical records 40% of person-records are not BITS alumnus.*

*Its observed that 95% of the software industry collaborators are from a pool comprising of both a BITS alumni network as well as member of research **(R)** in government initiatives. 90 % of collaborators who are alumnus is not a research member. 30% of the collaborators is a research member in government initiative but not a part of alumnus. Only 10% of collaborators are neither alumnus not a research member.*

Other unobserved dependency from above is any (both conditional or posterior) can be assumed to be equally likely to occur.

b. What is the chance that a person is an alumnus of BITS WILP approved for guest faculty role and not a member of government research, neither is collaborating with software industry nor registered for doctorate in BITS?

c. In order to approve an alumnus for the guest faculty role is it necessary to do a background verification to check if the person is a research member in government initiatives? Justify your answer with appropriate algorithm as discussed in class.



Question 1

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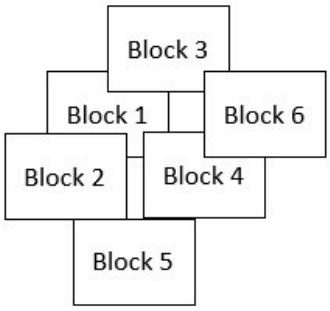
Qtext:-

[3+3+2=8 Marks]

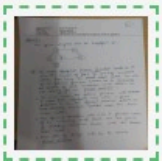
In the block world observe below that block 2,3 & 4 are placed on top of Block 1. Block 6 is positioned on top of blocks 3 & 4. Block 5 is adjacent to blocks 2 & 4. The blocks positioned one over the other or those which are adjacent are directly reachable from one another. The task is to assign color encoding to each of the blocks from the set {Red, Green, Blue} such no two directly reachable blocks must have the same color codes.



a. If local search and/or evolutionary algorithm is expected to be used to solve the problem, propose your design of the most appropriate fitness function to suit this problem. Does your design aim global maxima or global minima?

b. Using the results of part a., apply hill climbing algorithm only for first three iterations (first three goal tests). Depict all the steps of the search algorithm clearly. You may represent a state with {Variable= Value, …..} format instead of drawing the entire block configurations.

c. If evolutionary algorithm is expected to be applied to above problem, briefly explain your choice of solution design w.r.t to any evolutionary algorithm with example.



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Qtext:-

Answer the following questions for given game state: **[3+3+2=8 Marks]**

About the Game:

Soldier/Pawn (S) can move only one straight step ahead. Only if opponent coins are available, it can move in diagonally one step forward to attack the opponent coin. Under uncertainty, in the presence of other moves by the player, if the soldier has an advantageous position to attack the opponent then such moves are preferred by the player with 0.7 probability, else soldier moves with probability of 0.6. In either of the above cases all the remaining moves are equally likely to occur.

Horses/Knight(H) can move either forward/backward in L–shaped strides covering exactly 3 tiles. It is the only piece that can jump over other coins. If the player has lost all the soldiers, then all the knight's moves are equally likely to occur. If the Horse/Knight is positioned in any of the four corner of the board, then with 0.7 probability that player wins the game and with 0.3 probability the same player losses the game. In the absence of such positioning, the probability of a win for the player is 0.6 and that of loss for the same player is 0.4.

a. In this zero-sum game, if player with black colored pieces starts the play, construct game tree with utility up to level 2 or only one round per each player.
Static Evaluation Value = Utility of MAX player – Utility of MIN player
Utility of a player = Utility of player's Win + Utility of player's Loss

b. Apply Expectiminmax algorithm using the generated utility tree. Show each step & all the calculations in the algorithm

c. Design your own static evaluation function to suit the below three player chess game.