Q1 solutions

1 BC
2 ACD
3 ACD
4 AB
5 E
6 A
7 C
8 BD
9 E
10 ACD
11 AC
12 ABCD
13 ACD
14 ABC
15 A

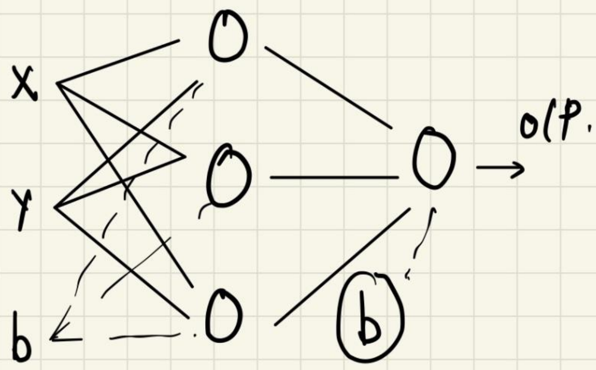
Question 2:

Blue print A : $\begin{cases} ((\text{not } X) \text{ and } Y) & > 0 \\ \text{else} & < 0 \end{cases}$

Blue print B : $\begin{cases} X = Y & > 0 \\ \text{else} & < 0 \end{cases}$

Blue print C : $\begin{cases} X = 0.5 \text{ and } Y = 0.5 & > 0 \\ \text{else} & < 0 \end{cases}$

Neural network:



(a) Number of parameters?

\# of parameter = (# of I/P nodes × # Hidden neuron) + (# Hidden × # of O/P) + Bias

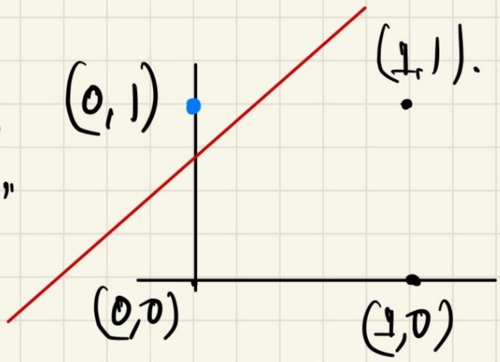
$= (2 \times 3) + (3 \times 1) + (3 + 1) = 13$

(b):-

As no-non-linearity → NN will act as linear seperator.

Blue print A :- ($\overline{X}$ and Y)

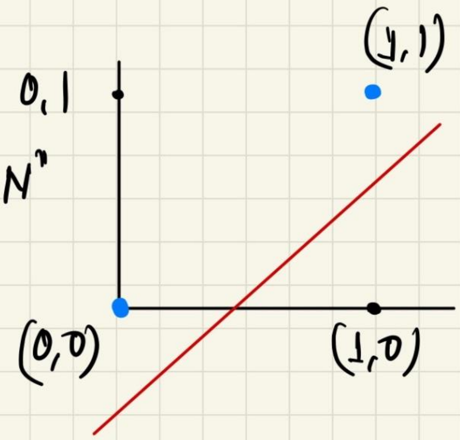
Can be represented by "NN"



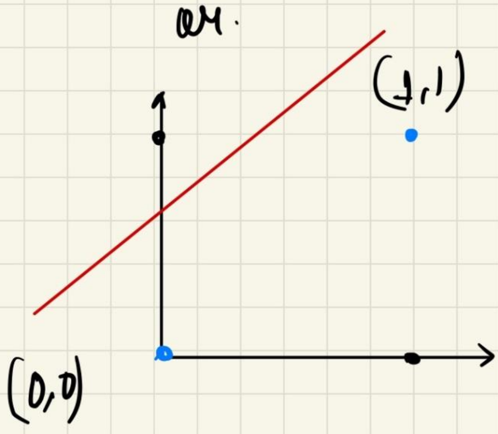
Blue print B :- (X = Y)

Cannot be represented by "NN"

# of misclassified input = 1.

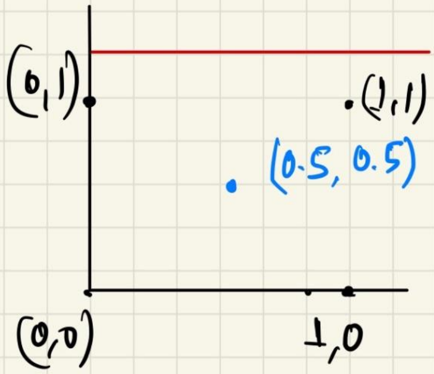


or.



Blueprint - C

(X=0.5 and Y=0.5)



Cannot be represented by "NN".

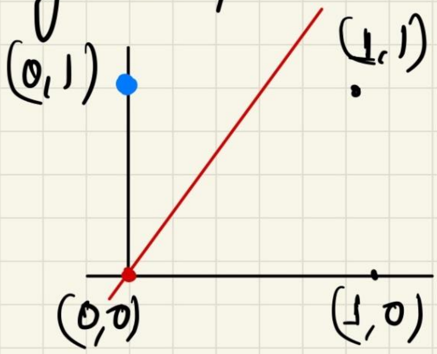
# of mis-classified input :- 1. i.e = (0.5, 0.5)

(C) If bias is removed :-

bias introduce offset / Intercept term

$$y = wx + b$$

If bias is removed then $y = wx$ passes through origin.

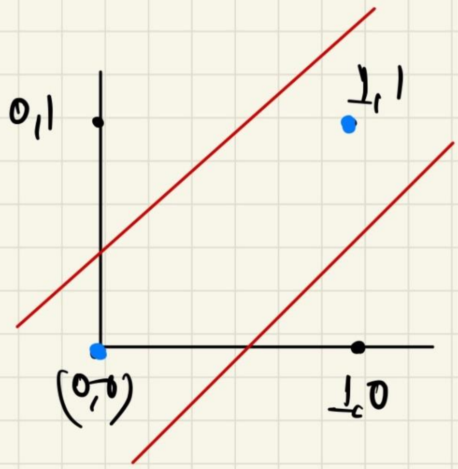


→ For A — NO
For B — NO
For C — NO.

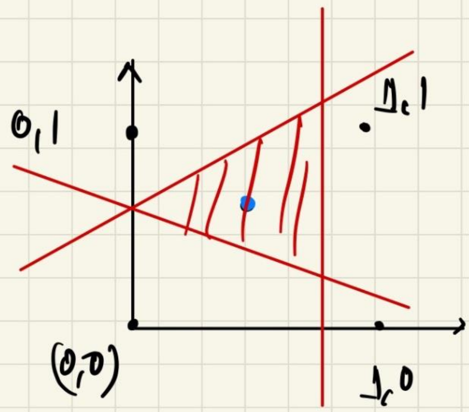
(d) If ReLU non-linearity is added.

Blueprint A
→ Can be represented.

Blueprint B
→ Can be represented.



Blueprint C.
→ Can be represented.



e) Can have multiple correct solution.

Grading rubric for 2

A) Correct number of parameters: 13 (1 Marks)
B) Correct representation of blueprint identification.

   Blueprint A - 1 Mark
   Blueprint B - 1 Mark
   Blueprint C- 1 Mark

   Correct misclassifier input identification B - 1 Mark
   Correct misclassifier input identification C - 1 Mark

C) Identifying Blueprint A not able to represent - 1 Mark
D) Identifying representability of
   Blueprint A - 1 marks
   Blueprint B - 1 marks
   Blueprint C - 1 marks

E) Correct weights - 2 Marks
   Logic/ intuition : Partial mask - 1 Mark

3) Rubric:
S: adding a_i's: 1, current time: 1 (no marks cut for defining extra states like sum $\le T$) ..
(solution should make it explicit that they're tracking time, and won't play after T)
T: 1 mark for defining it correctly between successor states, 1 mark for defining it as 0 for non successors, 1 mark for handling the last state at T
R: 1 mark for successor, 1 mark for non-successor, 1 mark for handling the last state at T
S0: 1

(b) Equation: 2 marks,
Simplifying V – 2 marks
Observation that V depends only on t – 2 marks
Answer – 2 marks

Note that marks have also been given for alternate formulations. State space must have cardinality $\ge T^K$ to be a correct solution. State spaces which only record the number of the last face are incorrect.

a) $S = \{(i, (a_1, \dots, a_k)) \mid i \in \{1, \dots, K\},\ a_i \in \{0 \dots T\},\ 1 \le \sum a_i \le T\} \cup \{(0, (0,0,\dots,0))\}$

$A = \{r\}$ (roll dice)

$$T((i,(a_1,\dots,a_K)), r, (j,(b_1,\dots,b_K))) = \begin{cases} \frac{1}{K} & b_j - a_j = 1,\ b_k = a_k\ \forall\ k \neq j \\ 0 & \text{otherwise} \end{cases}$$

$$R((i,(a_1,\dots,a_K)), r, (j,(b_1,\dots,b_K))) = \begin{cases} j + a_j & b_j - a_j = 1,\ b_k = a_k\ \forall\ k \neq j \\ 0 & \text{otherwise} \end{cases}$$

$s_0 = (0, (0,0,\dots,0))$

b) $$V(i,(a_1,\dots,a_K)) = \begin{cases} \sum_{j=1}^{K} \frac{1}{K}\left[V(j,(a_1,\dots,a_j+1,\dots,a_K)) + j + a_j\right], & \sum a_i < T \\ 0, & \sum a_i = T \end{cases}$$

$$V(i,(a_1,\dots,a_K)) = \frac{K+1}{2} + \sum_{j=1}^{K} \frac{1}{K} V(j,(a_1,\dots,a_j+1,\dots,a_K)) + \frac{\sum a_k}{K}$$ → prev. turn #

Rewriting V in terms of turn no.,

$$V(i,t) = \frac{K+1}{2} + \frac{t}{K} + \frac{1}{K}\sum_{j=1}^{K} V(j,t+1)$$

$$= \frac{K+1}{2} + \frac{t}{K} + \sum_j \frac{1}{K}\left[\frac{K+1}{2} + \frac{t+1}{K} + \sum_k \frac{1}{K} V(k,t+2)\right]$$

$$= \frac{K+1}{2}\cdot 2 + \frac{t}{K} + \frac{t+1}{K} + \sum_k \frac{V(k,t+2)}{K}$$

$$= \quad \vdots$$

$$= \frac{(K+1)}{2}(T-t) + \frac{t + (t+1) + \dots + T-1}{K} + \underbrace{\sum_z \frac{V(z,T)}{K}}_{=0}$$

$$V(i,t) = \frac{(K+1)(T-t)}{2} + \frac{1}{K}\left[\frac{T(T-1)}{2} - \frac{t(t-1)}{2}\right]$$

at s_0, $i=0$, $t=0$

$$\therefore \boxed{V(s_0) = \frac{(K+1)T}{2} + \frac{T(T-1)}{2K}}$$

9) Supervised learning task is training is the process of next word prediction i.e, given the current set of words, what is the next word that is being predicted.

Reward Model which is based on the supervised model selects the response which aligns with the human preference with state space being the conversation history and action being the next word predicted.

1 point - defining the supervised task ie next word prediction or next response prediction

1 point - creating the dataset based on conversations between two users or web text

1 point - defining the state space and actions where state space is the question or conversation history and action is the next set of tokens.

1 point - defining how reward is obtained (based on choosing the response with highest human preference)

4.

Solution 1. Incorporates the Justification in class.

Q4

$\left.\begin{matrix} 1 & G \\ 2 & M \\ 3 & Ch \\ 4 & T \end{matrix}\right\}$ Places $\left.\begin{matrix} 1 & F \\ 2 & A \\ 3 & W \\ 4 & E \end{matrix}\right\}$ Elements

Let c_{ij} be $\underbrace{(P_i = E_j)}_{\text{Place } i \text{ has element } j.}$

I. $(M=F) \wedge (Ch=F) \equiv c_{21} \wedge c_{31}$

II. $\neg(Ch=W) \wedge \neg(G=W) \equiv \neg c_{33} \wedge \neg c_{13}$

III. $(T=E) \wedge \neg(G=E) \equiv c_{44} \wedge \neg c_{14}$

IV. $\neg(Ch=A) \wedge \neg(T=A) \equiv \neg c_{32} \wedge \neg c_{42}$

Additionally, each place has a unique power, hence,

$(c_{i1} \wedge \neg c_{i2} \wedge \neg c_{i3} \wedge \neg c_{i4}) \vee (\neg c_{i1} \wedge c_{i2} \wedge \neg c_{i3} \wedge \neg c_{i4}) \vee$

$(\neg c_{i1} \wedge \neg c_{i2} \wedge c_{i3} \wedge \neg c_{i4}) \vee (\neg c_{i1} \wedge \neg c_{i2} \wedge \neg c_{i3} \wedge c_{i4}) \quad \forall i \in \{1 \dots 4\}$

converting to SOP,

$\forall i$, CNF of clauses $\Gamma_{i1} \dots \Gamma_{i12}$ such that for any Γ_{ij}, it has 4 literals of the variables c_{i1} c_{i2} c_{i3} c_{i4} & the num of true literals is either 0, 2, 3 or 4.

So, 48 such clauses.

we know that II is F. All the literals in I, III, IV are F. $\longrightarrow$ as per justification in Class.

So, the true clauses are :

$\{\neg c_{21}\}$ $\{\neg c_{31}\}$ $\{c_{33}, c_{13}\}$ $\{\neg c_{44}\}$ $\{c_{14}\}$ $\{c_{32}\}$, $\{c_{42}\}$

We know that $\forall i$ only one of c_{ij} can be true $\forall j$.

c_{14} ✓ c_{42} ✓ c_{32} ✓

Hence, both c_{33} & c_{13} are F.

Solution 2. Ignores the justification in class.

Q4

1 G
2 M
3 Ch
4 T
} Places

1 F
2 A
3 W
4 E
} Elements

Let c_{ij} be $\underbrace{(P_i = E_j)}_{\text{Place } i \text{ has element } j.}$

I. $(M = F) \wedge (G = F) \equiv c_{21} \wedge c_{31}$

II. $\neg(Ch = W) \wedge \neg(G = W) \equiv \neg c_{33} \wedge \neg c_{13}$

III. $(T = E) \wedge \neg(G = E) \equiv c_{44} \wedge \neg c_{14}$

IV. $\neg(Ch = A) \wedge \neg(T = A) \equiv \neg c_{32} \wedge \neg c_{42}$

Additionally, each place has a unique power, hence,

$(c_{i1} \wedge \neg c_{i2} \wedge \neg c_{i3} \wedge \neg c_{i4}) \vee (\neg c_{i1} \wedge c_{i2} \wedge \neg c_{i3} \wedge \neg c_{i4}) \vee$
$(\neg c_{i1} \wedge \neg c_{i2} \wedge c_{i3} \wedge \neg c_{i4}) \vee (\neg c_{i1} \wedge \neg c_{i2} \wedge \neg c_{i3} \wedge c_{i4}) \quad \forall i \in \{1 \dots 4\}$

converting to SOP,

$\forall i$, CNF of clauses $\Gamma_{i1} \dots \Gamma_{i12}$ such that for any Γ_{ij}, it has 4 literals of the variables c_{i1} c_{i2} c_{i3} c_{i4} & the num of true literals is either 0, 2, 3 or 4.

So, 48 such clauses.

we know that I, II, III, IV are false.

True clauses are →

$\{\neg c_{21}, \neg c_{31}\}$ $\{c_{33}, c_{13}\}$ $\{\neg c_{44}, c_{14}\}$ $\{c_{32}, c_{42}\}$

So either c_{33} is true or c_{13} is true.

(A) Try to find assignments that have c_{33} / c_{13} as T.
(B) Refute either of the two unit clauses.

Both hold the possibility of being True.

Final Rubric

Rubric:

- Defining symbols for 4 places and 4 powers – 2 marks.
- Converting each statement into negated (because they are lies) logical expressions – 7 marks. (1 for imam, 2 each for others) //whether on original interpretation or updated or mixed. Logical expressions need not be clauses.

    - -3 if negations is not done
    - -1 for every incorrect or missed logical expression
- 2 marks for conversion of uniqueness into logical expressions.
    - -1 if uniqueness is in words
- 5 marks for inference – can use resolution, forward checking or modus ponens. But, using basic logic in words is not enough.
    - -4 if inference is mostly incorrect or loosely mentioned in words
    - -1 Solution was unsat, but student didn't consider all logical propositions
    - -2 Some Flaws in inference
- 1 mark for final answer. (could be that "given KB is not satisfiable, or the right answer – depending upon interpretations)

Q5.a)

State : A state will represent ***all*** the possible planets where the rebels can be at the current step. So mathematically, the states will be subsets of the Power Set of $N = \{1, 2, \ldots 7\}$.
$s \in P(N)$

Action : An action represents warping to a particular star. So $a \in N$

Transition Function : After performing the action, at the next timestep, rebels can be at any star which is a neighbour of the current star apart from the planet where we are at (as we would have captured them if it were the case)
Formally : $T(s, a) = \cup \{Neighbours(p) : p \in s\} \ \setminus \ a$

3 marks for formal representation as shown above or in any other equivalent form

Goal State : If the set s is empty

Start State : $s = N$

For above solution :

- 3 points for correct state representation
- 1 point for correct action
- 3 points for correct transition function
- 1 points for correct goal state
- 1 point for correct start state
- 3 points for drawing the correct search tree

5. b)
Heuristic 1 (3 points) : The number of planets where the rebels are at a given time.
Formally $h(s) = |s|$ (Number of planets

Heuristic 2 (1.5 points) : $h(s) = 1 \; if \; s > 0 \; else \; 0$ 0.5 marks deducted only mentioned h(s) = 1

Heuristic 3 (1 points) : $h(s) = 0$

(0.5 points) : Some other heuristic with correct idea correct but not admissible

5. c) An optimal solution with 5 actions
Check the stars in the following order -

- {1,3,5,7} a = 2
- {4,6} a = 3
- {5,7} a = 4
- {6} a = 3
- {7} a = 6
- {}

(3 points) :
First action at t=0:
3 -> e1 -> 3 -> e2 -> 3 -> e3 (e1,e2,e3 all different)
First action at t=1:
e1 -> 3 -> e2 -> 3 -> e3 (e1,e2,e3 all different)
Or any other optimal plan

(2 points):
Solution as above but did not mention that e1,e2,e3 have to be all different
Eg - (2,3,4,3,2) does not reach the goal state

(2 points) :
Any other plan which reaches the goal state but is not optimal

(1 point) :
Partially correct plan

5.d) An optimal solution with 10 actions

- We check the planets in the order as in part c
- If we manage to capture then we are done
- Otherwise the rebels must have started in an even planet, so after 5 time units, they must be in an odd planet
- So we check the planets the same order again

(3 points) : Optimal plan as shown above

(2 points) : Idea correct but plan is not optimal

(1 point) : Idea correct but plan not specified / plan does not reach the goal state

Other solutions might get partial/full credit.

6. (a) No

   (a) Yes

   (b) $P(I_1 = L, F_1 = Y) = 0.8*0.35 = 0.28$
   $P(I_1 = M, F_1 = Y) = 0.1*0.4 = 0.04$
   $P(I_1 = H, F_1 = Y) = 0.1*0.8 = 0.08$
   $P(I_1 = L \mid F_1 = Y) = 0.28/0.4 = 0.7$
   $P(I_1 = M \mid F_1 = Y) = 0.04/0.4 = 0.1$
   $P(I_1 = H \mid F_1 = Y) = 0.08/0.4 = 0.2$

   2 marks for correct expressions
   1 mark for calculation

   (c) Paracetamol at t=1 ($V_1 = F$):
   $P(I_2 = L, F_1 = Y, V_1 = F) = 0.1*0.8*0.05+0.1*0.4*0.05+0.8*0.35*0.9 = 0.258$ - 0.5 mark
   $P(I_2 = M, F_1 = Y, V_1 = F) = 0.1*0.8*0.05+0.1*0.4*0.9+0.8*0.35*0.05 = 0.054$ - 0.5 mark
   $P(I_2 = H, F_1 = Y, V_1 = F) = 0.1*0.8*0.9+0.1*0.4*0.05+0.8*0.35*0.05 = 0.088$ - 0.5 mark
   $P(I_2 = L \mid F_1 = Y, V_1 = F) = 0.258/0.4 = 0.645$ - 0.5 mark
   $P(I_2 = M \mid F_1 = Y, V_1 = F) = 0.054/0.4 = 0.135$ - 0.5 mark
   $P(I_2 = H \mid F_1 = Y, V_1 = F) = 0.088/0.4 = 0.22$ - 0.5 mark

   Here is an alternate solution:
   P(I_2 = | F_1 = Y) = \sum_{i} P(I_2 = L | {I_1 =i, F_1 = Y, V_1 = F)P(I_1 =i | F_1 = Y)
    = \sum_{i} P(I_2 = L | {I_1 =i, V_1 = F)P(I_1 =i | F_1 = Y)
   //note second prob already computed in part (c)
   = 0.9*0.7 + 0.05*0.1 + 0.05*0.2
   = 0.63 + 0.005 + 0.01 = 0.645 (and so on).

Note that by intelligently using calculation of part (c), part (d) becomes very easy, and does not even require normalization!

Rubric: 3 marks for writing the correct formulas for computation, 3 marks for calculation (1.5 each)

   Antiviral at t=1 ($V_1 = T$):
   $P(I_2 = L, F_1 = Y, V_1 = T) = 0.1*0.8*0.1+0.1*0.4*0.7+0.8*0.35*0.8 = 0.26$ - 0.5 mark
   $P(I_2 = M, F_1 = Y, V_1 = T) = 0.1*0.8*0.5+0.1*0.4*0.2+0.8*0.35*0.2 = 0.104$ - 0.5 mark
   $P(I_2 = H, F_1 = Y, V_1 = T) = 0.1*0.8*0.4+0.1*0.4*0.1+0.8*0.35*0 = 0.036$ - 0.5 mark
   $P(I_2 = L \mid F_1 = Y, V_1 = T) = 0.26/0.4 = 0.65$ - 0.5 mark
   $P(I_2 = M \mid F_1 = Y, V_1 = T) = 0.104/0.4 = 0.26$ - 0.5 mark

$P(I_2 = H \mid F_1 = Y, V_1 = T) = 0.036/0.4 = 0.09$ - 0.5 mark

(d) Expected Reward for Paracetamol (V_1 = F) = -10 + 0.645*500+0.135*50+0 = 319.25
Expected Reward for Anti-Viral (V_1 = T) = -30 + 0.65*500+0.26*50+0 = 308
Ans: Paracetamol

Grading scheme: 1 mark for right equation, 1 mark for using correct probabilities from previous step, 1 mark for calculation, 1 mark for correct final action

(e) $P(I_2 = L, F_1 = Y) =$
$P(I_1 = L)*P(F_1 = Y \mid I_1 = L) *(P(B_1 = L \mid I_1 = L) * P(I_2 = L \mid I_1 = L, V_1 = F) + P(B_1 = NL \mid I_1 = L) * P(I_2 = L \mid I_1 = L, V_1 = T))$ +
$P(I_1 = M)*P(F_1 = Y \mid I_1 = M) * (P(B_1 = L \mid I_1 = M) * P(I_2 = L \mid I_1 = M, V_1 = F) + P(B_1 = NL \mid I_1 = M) * P(I_2 = L \mid I_1 = M, V_1 = T))$ +
$P(I_1 = H)*P(F_1 = Y \mid I_1 = H) * (P(B_1 = L \mid I_1 = H) * P(I_2 = L \mid I_1 = H, V_1 = F) + P(B_1 = NL \mid I_1 = H) * P(I_2 = L \mid I_1 = H, V_1 = T))$
=0.8*0.35*(0.8*0.9+0.2*0.8) +
0.1*0.4*(0.2*0.05+0.8*0.7) +
0.1*0.8*(0.2*0.05+0.8*0.1)
= 0.2764 - 2 marks

Similarly,
$P(I_2 = M, F_1 = Y)$ = 0.8*0.35*(0.8*0.05+0.2*0.2) +
0.1*0.4*(0.2*0.9+0.8*0.2) +
0.1*0.8*(0.2*0.05+0.8*0.5)
= 0.0688 - 2 marks

$P(I_2 = H, F_1 = Y)$ = 0.8*0.35*(0.8*0.05 + 0.2*0) +
0.1*0.4*(0.2*0.05+0.8*0.1) +
0.1*0.8*(0.2*0.9+0.8*0.4)
= 0.0548 - 2 marks

$P(I_2 = L \mid F_1 = Y) = 0.2764/0.4 = 0.691$ - 1 mark
$P(I_2 = M \mid F_1 = Y) = 0.0688/0.4 = 0.172$ - 1 mark
$P(I_2 = H \mid F_1 = Y) = 0.0548/0.4 = 0.137$ - 1 mark
Expected positive reward = 0.691*500+0.172*50 = 354.1

$P(V_1 = \text{False} \mid F_1 = Y) = P(T_1 = L \mid F_1 = Y) = 0.62$ - 0.5 mark
$P(V_1 = \text{True} \mid F_1 = Y) = P(T_1 = NL \mid F_1 = Y) = 0.38$ - 0.5 mark
Expected negative reward = 0.62*(-10) + 0.38*(-30) = -17.6

Total reward = 354.1 - 17.6 = 336.5 - 1 mark
Gap = 336.5 - 319.25 = **17.25** - 1 mark

$$P(I_{t+1}=i \mid f_{1:t})$$

$$= \sum_{\forall I_{1:t}} P(\underset{i}{\underset{\|}{I_{t+1}}}\, I_t I_{t-1} \cdots I_1 \mid f_{1:t})$$

$$= \sum_{\forall I_{1:t}} P(I_{t+1}=i \mid I_t)\, P(I_t I_{t-1} \cdots I_1 \mid f_{1:t})$$

$$= \sum_{\forall I_t} \sum_{\forall I_{1:t-1}} P(I_{t+1}=i \mid I_t)\, P(I_t I_{t-1} \cdots I_1 \mid f_{1:t})$$

$$= \sum_{\forall I_t} P(I_{t+1}=i \mid I_t) \sum_{\forall I_{1:t-1}} P(I_t I_{t-1} \cdots I_1 \mid f_{1:t})$$

$$= \sum_{\forall I_t} P(I_{t+1}=i \mid I_t)\, P(I_t \mid f_{1:t})$$

$$= \sum_{\forall I_t} P(I_{t+1}=i \mid I_t)\, \frac{P(f_t \mid I_t f_{1:t-1})\, P(I_t \mid f_{1:t-1})}{P(f_t \mid f_{1:t-1})}$$

$$= \sum_{\substack{\forall I_t \\ \in j}} P(I_{t+1}=i \mid I_t)\, \frac{P(f_t \mid I_t f_{t-1})}{P(f_t \mid f_{1:t-1})}\, \delta_t(j)$$

$$\therefore \delta_{t+1}(i) = \sum_{j \in \{L,M,H\}} P(I_{t+1}=i \mid I_t=j)\, \frac{P(f_t \mid I_t=j f_{t-1})}{P(f_t \mid f_{1:t-1})}\, \delta_t(j)$$

(f) Solution uses Marginalization, D-seperation and Conditional Probability respectively. Graded subjectively.

7) Total marks = 9 (Undivided)

Marks distribution: (a) -> 2, (b) -> 3, (c) -> 4.

a)2: Correct equation.
0: otherwise.

7) a) $Q(s,a) \leftarrow Q(s,a) + \alpha\left(r + \gamma \max_{a'} Q(s',a') - Q(s,a)\right)$

b) 3: Correct answer.
   0: Otherwise.

$$b)\ Q(s,a) \leftarrow Q(s,a) + \alpha \frac{T_{real}(s,a,s')}{T_{sim}(s,a,s')}\left(r + \gamma \max_{a'} Q(s',a') - Q(s,a)\right)$$

c) 4: correct for all 4 parameters
   2: Minor mistake or correct approach.

$$c)\ \theta_0 = \theta_0 + \alpha\left(r + \gamma \max_a U(x',y') - U(x,y)\right)$$

$$\theta_1 = \theta_1 + \alpha\left(r + \gamma \max_a U(x',y') - U(x,y)\right)x.$$

$$\theta_2 = \theta_2 + \alpha\left(r + \gamma \max_a U(x',y') - U(x,y)\right)y.$$

$$\theta_3 = \theta_3 + \alpha\left(r + \gamma \max_a U(x',y') - U(x,y)\right)\sqrt{(x-x_g)^2+(y-y_g)^2}$$

   0: others.

8. a)

- Negative costs introduce the possibility of infinite paths with decreasing costs. To traverse all these paths, the algorithm needs to explore the whole search space.

- An edge with high negative value that leads to the most optimal path can be left unexplored if all the nodes of the search space are not explored.

- The edge to the last state may have extremely high negative cost making the whole path optimal.

Rubric: subjective; if the above key ideas are expressed - 2 marks
If answer is around the key idea - 1 mark

b)No, A* stops when the first goal is removed from the fringe. Imagine a path from start state to optimal goal that goes through another intermediate goal. At some point, the intermediate goal will be removed from the fringe, and A* will terminate.

Rubric - No, with this answer will get 2 marks
No, with any other explanation will get 1 mark

Yes, the heuristic guides the search by providing an optimistic estimate of the remaining cost, helping A* prioritise paths that seem promising. The negative edge values may influence the actual path cost, but the heuristic ensures that A* makes informed decisions leading to an optimal solution.

Rubric: this answer is incorrect, but will get 1 mark
Yes, with no/ any other explanation - 1 mark

The real answer is actually technical! A* stops when the first goal is removed from the fringe. Imagine a path from start state to optimal goal that goes through another intermediate goal. At some point, the intermediate goal will be removed from the fringe, and A* will terminate. Hence the real answer is NO and this reasoning should give 2 marks.

Rubric: Yes with explanation you give – 1
Yes, with no/any other explanation - 0 marks

c) (i) Depth first search :

(c-c*) <= (Max cost)d - m*r / (c-c*) <=c+m*r   / unbounded/infinite - **2 marks**

(c-c*) <= (m-d).r   **- 1 mark**

(ii) Breadth first search :

same as above

(iii) Uniform cost search: (m-1).r   **- 2 mark**

Any other answer will get no marks

10- Formalising the problem and writing propositional literals for the statements given. Subjective, depends on the progress made. 2.5 marks for each statement.

7 marks- Tried resolving the set of True clauses. Either by solution 1 or solution 2. If got stuck in between due to either both being true or none being true, full marks.