বাংলাদেশ ইউনিভার্সিটি অব প্রফেশনালস্

সেকশন/গ্রুপ: **Section-B**

ইনভিজিলেটরের স্বাক্ষর

মোট পৃষ্ঠা সংখ্যা: **09** টি

BSc. in CSE-17 Final Exam (Spring) Feb-21 পরীক্ষা(Examination), 20 **21**

বিষয় (Subj): **Artificial Intelligence** পত্র/কোর্স নং (Paper/Course No): **CSE-403**

পত্র/কোর্সের নাম (Paper/Course Name): **CSE-17** কেন্দ্র (Center): **MIST**

রেজিঃ নম্বর (Regn No): **131401170018** শিক্ষাবর্ষ (Session): **2019-2020**

রোল নম্বর (Roll No): **201714018** তারিখ (Date): **24-02-2021**

INSTRUCTIONS FOR EXAMINEE

1. Examinees are forbidden to write their names either on outer cover page or anywhere of the answer scripts. In case of violation, the answer script will not be evaluated.

2. Examinees must mention their roll and registration number along with session on the outer cover page of the answer scripts clearly. Otherwise, answer scripts may not be evaluated.

3. Students will write his examination roll number on the top left corner and section-A/B on the top right corner of each page. All pages must be numbered chronologically at the bottom center in x of y format. (for example: 1 of 21)

4. In no case, an examinee will be allowed to start the examination half an hour after the commencement of examination.

5. The Camera of the examinee MUST always be ON during the examination and answer script submission. If Camera is OFF then that online examination will be treated as CANCELLED.

6. The focus of the camera should be such that the invigilator(s) can see the script and examinee with his/her surroundings.

7. Students are to share their entire screen of desktop/laptop to the invigilator throughout the online examination. .

8. Browsing any files other than the given question paper (PDF) and/or online sites other than the respective allowed examination platform (e,g Zoom, Google classroom etc.) is strictly prohibited.

9. Online invigilators reserve the right to take remote access of the examinee's desktop/laptop and investigate as needed at any point during the examination or even after the examination

10. Students without laptop/desktop cannot appear exam online by using mobile phone. Students not possessing laptop/desktop, will have to appear examination Physically at MIST.

পরীক্ষক কর্তৃক পূরণীয়

প্রশ্ন নম্বর	প্রদত্ত নম্বর
১	
২	
৩	
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মোট	

পরীক্ষকের স্বাক্ষর

নিরীক্ষকের স্বাক্ষর

INSTRUCTIONS FOR EXAMINEE

11. Examinees must abide by the instructions of chief invigilator if there are no definite instructions on any subject/matter.

12. No examinee will be allowed to leave the examination session until an hour has elapsed from the commencement of examination.

13. Legal action will be taken against the examinees those are trying to adopt/adopting unfair means/exibiting unbecoming conduct in the examination hall and found guilty for any breach of discipline as per rule.

14. Invigilators will have complete authority of deducting marks from any student attempting unfair means.

15. All rough works should be done in the same paper used as answer scripts. Answer scripts should be submitted intact. Papers used for rough work should be pen through by the examinees and submitted along with the answer script.

16. The answer scripts submitted beyond specified time will be treated as CANCELLED.

17. The examinee will send his/her scanned examination script in PDF format to the following e-mail addresses:

    (a)   e-mail address of subject invigilator/examiner.

    (b)   Central Database Scheme (coursecode@mist.ac.bd)

        Example: EECE433@mist.ac.bd

18. The examinee has to preserve the original answer script of every examination and be ready to submit whenever asked for.

19. Answer script should be the A4 size papers with a cover page provided by Department. Examinee has to fill up his/her necessary details on the cover page. Section A and section B must be clearly marked on the cover page like. | **Section A** | or | **Section B** |

20. Examination duration for each subject will be two hours (section-A for one hour + section B for One hour). In between students will get 15 minutes time to submit the answer script of section A and 5 minutes time to issue the question for section B . After completion of 01 hour examination time for section B, students will get 15 minutes to submit the answer script of section B.

21. After completion of written examination (online/physical), viva will be conducted by the respective faculty of that subject.

Section-B

Ans. to the ques. no.-05(a)

For Age:

values	Yes	No	Entropy
<=30	2	3	0.97
31-40	4	0	0
>40	3	2	0.97

Information Gain $= E(S) - \left(\frac{5}{14} \times 0.97 + \frac{4}{14} \times 0 + \frac{5}{14} \times 0.97\right)$

$$= 0.94 - 0.69$$

$$= 0.25$$

For Income:

values	Yes	No	Entropy
High	2	2	1
Medium	4	2	0.92
Low	3	1	0.81

Information Gain $= E(S) - \left(\frac{4}{14} \times 1 + \frac{6}{14} \times 0.92 + \frac{4}{14} \times 0.81\right)$

$$= 0.94 - 0.91$$

$$= 0.03$$

P.T.O.

For student :

Values	Yes	No	Entropy
Yes	6	1	0.59
No	3	4	0.99

$$\therefore IG = E(S) - \left(\frac{7}{14} \times 0.59 + \frac{7}{14} \times 0.99 \right)$$

$$= 0.94 - 0.79$$

$$= 0.15$$

For Credit Rating :

Values	Yes	No	Entropy
Fair	6	2	0.81
Excellent	3	3	1

$$\therefore IG = E(S) - \left(\frac{8}{14} \times 0.81 + \frac{6}{14} \times 1 \right)$$

$$= 0.94 - 0.89$$

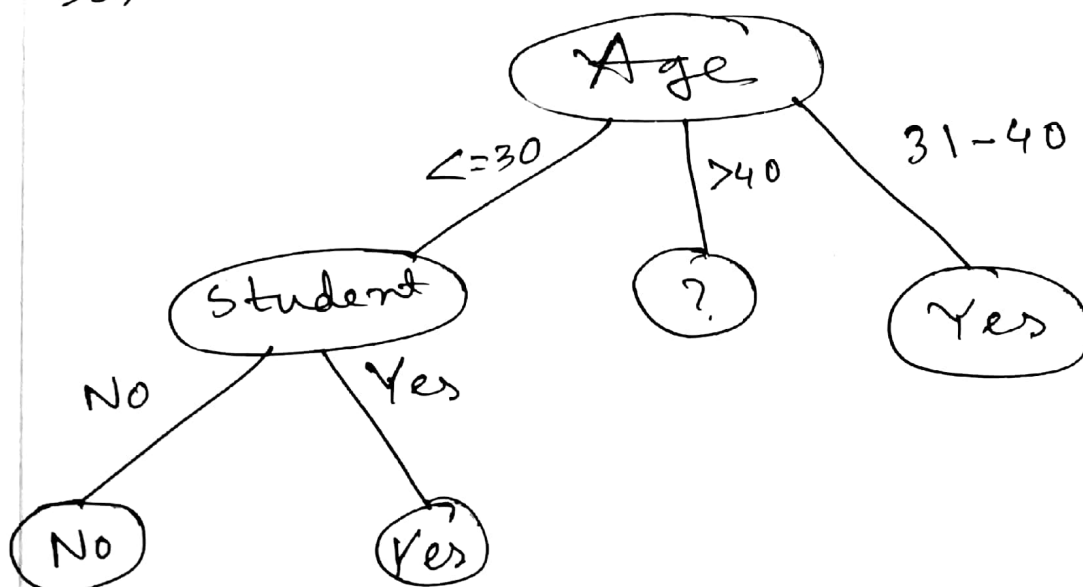$$= 0.05$$

So, Attribute chosen = 'Age' with larget

Info Gain.

0.2 or 0.9
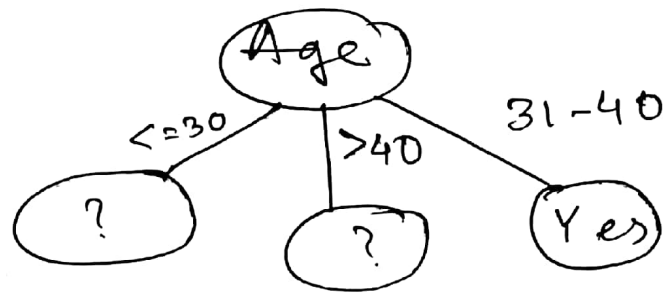
Age <=30 :

Income	Student	Credit		BuyCom
High	No	fair		No
High	No	Excellent		No
Medium	No	fair		No
Low	Yes	fair		Yes
medium	Yes	Excellent		Yes

Student most describes best with Buy Com

So,

Age >40:

Income	(X) student	Credit	Buy Comp
Medium	No	Fair	Yes
Low	Yes	Fair	Yes
Low	Yes	Excellw	No
Medium	Yes	Fair	Yes
medium	No	Excellad	No

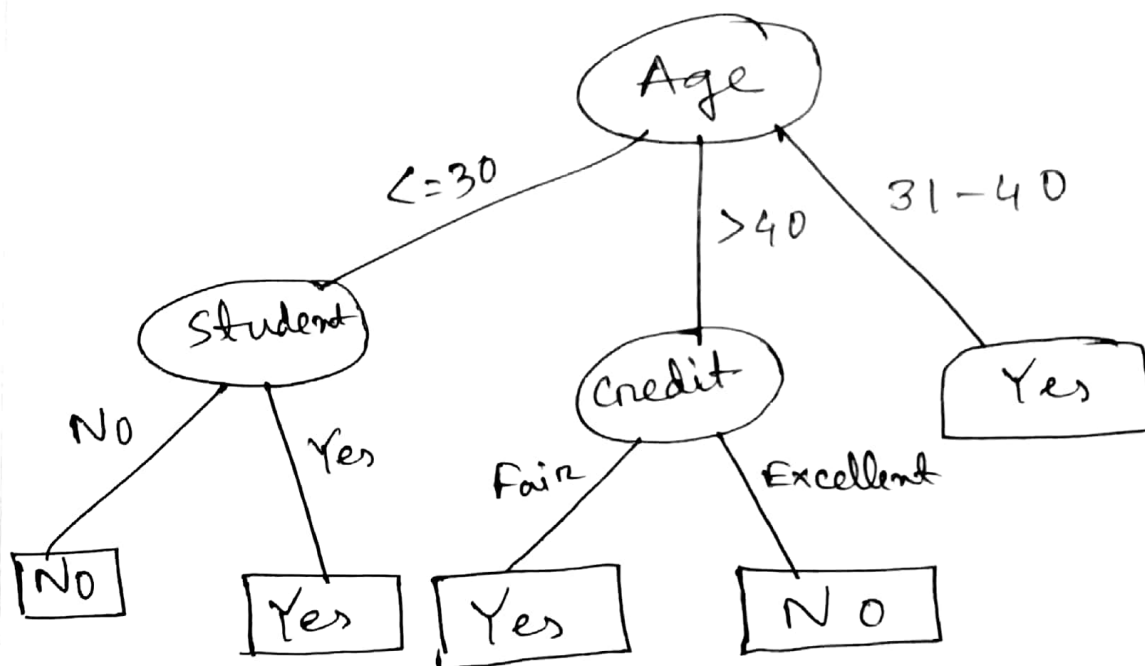Credit Col describes perfectly with Buy Computer. Fair → Yes, Excellent → No.

Fig: Final Decision Tree.

Ans. to the ques.no.-05(b)

$x_1 = 0$, $x_2 = 1$,

sigmoid function $S(x) = \dfrac{1}{1 + e^{-x}}$ [$S(x)$, sigmoid, $= 6(x)$]

Output of A = $S\left(x_1 \times 20 + x_2 \times 20 + 1 \times (-30) \right)$

$= S\left(0 \times 20 + 1 \times 20 - 30 \right)$

$= S(-10)$

$= \dfrac{1}{1 + e^{10}}$

$= 4.54 \times 10^{-5}$

Output of $B = S\left(x_1 \times (-20) + x_2 \times (-20) + 1 \times 10 \right)$

$= S\left(0 \times (-20) + 1 \times (-20) + 10 \right)$

$= S(-10)$

$= 4.54 \times 10^{-5}$

P.T.O.

Output of $C = S\left(A \times 20 + B \times 20 + 1 \times (-10)\right)$

$$= S\left(-9.99\right)$$

$$= S\left(-10\right)$$

$$= 4.54 \times 10^{-5}$$

which is almost 0.

So, output from C will be 0. for

XNOR of $x_1 = 0$ and $x_2 = 1$

(Ans)

Ans. to the ques. no. - 07(a)

(i) Ans:

Occupation (Emily, Surgeon) $\lor$
    Occupation (Emily, Lawyer)

(ii) Ans:

Occupation (Joe, Actor) $\land \exists_0$ Occupation(Joe, 0)

(iii) Ans:

$\exists_x$ Boss(x, Emily) $\Rightarrow$ Occupation (x, Lawyer)

(iv) Ans:

$\forall_x$ Occupation (x, Surgeon) $\Rightarrow$ ~~Customer (~~
    ~~$\exists_y$ Customer (x,~~
    ~~$\exists_y$ Customer Occupation (y, Lawyer)).~~
                    $\land$
    $\exists_y$ Customer (x, Occupation (y, Lawyer))

An to the ques. no. - 07(b)

Step 1 : elemination of $\Leftrightarrow$ and $\Rightarrow$:

$$\forall x \left[\forall_y P1(y) \Rightarrow P2(x,y) \right] \Rightarrow \left[\exists_y P2(y,x) \right]$$

$$\forall x \neg \left[\forall_y \neg \left[P1(y) \vee P2(x,y) \right] \right] \vee \exists_y P2(y,x)$$

~~$\forall x \exists y [\forall y \exists P1(y) \wedge \neg P2(x,y)$~~

Step 2 : $\neg$ to Inwards!

$$\forall x \neg \left[\forall_y \neg P1(y) \wedge \neg P2(x,y) \right] \vee \exists_y P2(y,x)$$

$$\forall x \exists y \left[P1(y) \wedge P2(x,y) \right] \vee \exists_y P2(y,x)$$

Step 3 : ~~Distributive~~; Removing $\exists y$ with ~~Existy~~ ~~skolemization~~ Skolemization $H(x)$

$$\forall x ~~\exists y~~ \left[P1(H(x)) \wedge P2(x, H(x)) \right] \vee P2(H(x), x)$$

Step 4 : Drop $\forall x$:

$$\left[P1(H(x)) \wedge P2(x, H(x)) \right] \vee P2(H(x), x)$$

step 5 : Distributibe :

$$\left(P1(H(x)) \vee P2(H(x), x) \right) \wedge \left(P2(x, H(x)) \vee P2(H(x), x) \right)$$

$\Leftrightarrow$

Ans. to the ques. no.- 07(c)

After apply CNF:

(a) A1.   Animal $(F(x))$ V Loves $(G(x), x)$

A2. $\neg$ Loves $(x, F(x))$ V Loves $(G(x), x)$

B. $\neg$ Loves (y, x) V $\neg$ Animal (z) V
                        $\neg$ kills (x, z)

C. $\neg$ Animal (x) V Loves $(Jack, x)$

D.   Kills $(Jack, Tuna)$ V Kills $(Curiosity, Tuna)$

E.   Cat $(Tuna)$

F. $\neg$ Cat (x) V Animal (x)

F. $\neg$ Kills $(Curiosity, Tuna)$ [∴ negated
                                        goal CNF
                                        form]

So, Kills (Curiosity, Tuna) in true from the resolution proof.