Assignment 10

Computational Advertising

(1) Given advertisers A & B with 2 $ each

A query on word x and y

B query on word x and z

Eg :- x z z x

	A	B
	2	2
x	1	2
z	1	1
z	1	0
x	0	0

↑ Satisfied

	A	B
	2	2
x	2	1
z	2	0
z	2	-
x		

↑ not satisfied

Eg :- y y x x

	A	B
	2	2
y	1	2
y	0	2
x	0	1
x	0	1

← Satisfied

(2) Given sets,

AB, BC, CD, DE, EF, FG, GH, AH, ADG, ADF

Dumb method

AB, BC, CD, DE, EF, FG, GH ⇒ 7

Simple method

AB, BC, CD, DE, EF, FG, GH => 7

Largest first method

ADG, ADF, AB, BC, DE, GH => 6

Most Help method

ADG, BC, EF, AH => 4

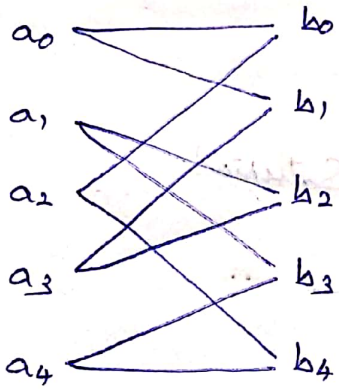
∴ Ratio for dumb $\frac{7}{4} = 1.75$

Ratio for simple $= \frac{7}{4} = 1.75$

Ratio for LF $= \frac{6}{4} = 1.5$

Ratio for MH $= \frac{4}{4} = 1$

(3) Given bipartite graph



Some perfect matchings are

$a_0 - b_0$	$a_0 - b_1$
$a_1 - b_2$	$a_1 - b_3$
$a_2 - b_4$	$a_2 - b_0$
$a_3 - b_1$	$a_3 - b_2$
$a_4 - b_3$	$a_4 - b_4$

(4) Given, click throughs rates for positions 1, 2 and 3

Advertiser	Bid	CTR1	CTR2	CTR3	Budget
A	0.10	0.75	0.70	0.003	$1
B	0.09	0.16	0.012	0.006	$2
C	0.08	0.17	0.014	0.007	$3
D	0.07	0.18	0.015	0.008	$4
E	0.06	0.19	0.016	0.010	$5

Since in slot 1, the expected revenue for A is higher i.e 0.0015

In slot 2, C is selected because 0.00112 is higher

In slot 3, E is selected because 0.0006 is higher

Exp 1	Exp 2	Exp 3
0.0015	0.001	0.0005
0.0014	0.001	0.00054
0.00126	0.00112	0.00056
0.00126	0.00105	0.00056
0.00114	0.00096	0.0006

slot	Adv	CTR	click - throughs	
1	A	0.015	10	∵ budget/bid = 1/0.1 = 10
2	C	0.014	9	∵ $10 \times \frac{0.014}{0.015}$
3	E	0.010	7	∵ $10 \times \frac{0.01}{0.015}$

The first phase ends when A gets 10 click throughs and now A runs out of budget.

So, for second phase A is not eligible

B takes the first slot because 0.014 is higher than C, D, E. C takes 2nd slot and E gets 3rd slot

slot	Adv	CTR	click throughs
1	B	0.016	22 ∵ Budget/Bid = 2/0.09
2	C	0.014	19 ∵ $22 \times \frac{0.014}{0.016}$
3	E	0.01	14 ∵ $22 \times \frac{0.01}{0.016}$

For second phase, B gets 22 click throughs and exhausts its budget

Now, for third phase, C gets 1st slot, D gets 2nd slot E gets 3rd slot

slot	Adv	CTR	clickthroughs
1	C	0.017	8
2	D	0.015	7
3	E	0.010	5

The 3rd phase ends when 20 clicks are allocated

Summing up the click throughs for 3 phases,

A → 10

B → 22

C → 36

D → 7

E → 26