Batch: Roll No.:
Experiment / assignment / tutorial No.
Grade: AA / AB / BB / BC / BB / BC / BF

Name - Aarya Tiwari
Roll no. - 1601042119
Batch - B2

ITC Tut 2.

Q1) Arithmetic coding "PROOF".

Q2) LZW coding "banana-badadaa".
↳ efficiency

Q3) Run Length (RLE) $\underbrace{1111\cdots}_{15}\underbrace{000\cdots00}_{20}\underbrace{1111}_{4}$

Batch: Roll No.:
Experiment / assignment / tutorial No.
Grade: AA/ AB / BB / BC / CC / CD / DD

Signature of the Faculty In-Charge with date

Q1) Probability of P = $\frac{1}{5}$ = 0.2

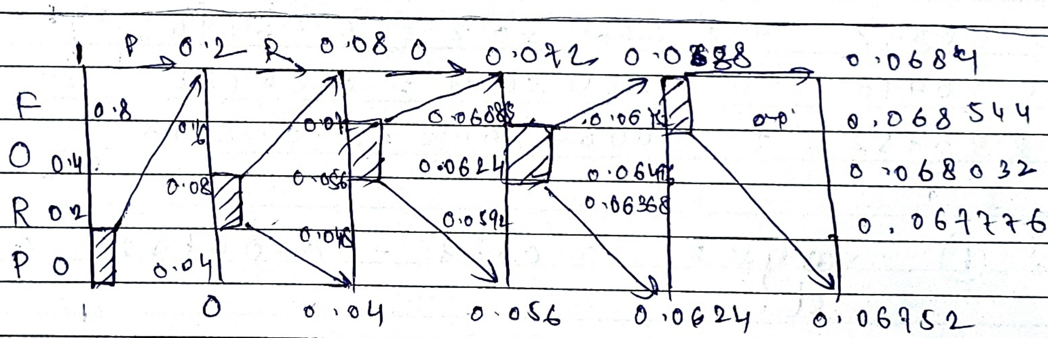
Formula for d = upper limit (ul) - lower limit (ll)

Probability of R = $\frac{1}{5}$ = 0.2

Formula for Range R = ll + d × P(x)

Probability of O = $\frac{2}{5}$ = 0.4

Probability of F = $\frac{1}{5}$ = 0.2



For (P) range = 0.2 - 0 = 0.2

0 + (0.2 - 0) × 0.2 = 0.04
0.04 + (0.2) × 0.2 = 0.08
0.08 + (0.2) × (0.4) = 0.16
0.16 + (0.2) × (0.2) = 0.2

For (R) range = 0.08 - 0.04 = 0.04

0.04 + 0.04 × 0.2 = 0.048
0.048 + 0.04 × 0.2 = 0.056
0.056 + 0.04 × 0.4 = 0.072
0.072 + 0.04 × 0.2 = 0.08

~~For (O) range = 0.072 - 0.056 = 0.016.~~

~~0.056 + 0.016 × 0.2 = 0.0592~~
~~0.0592 + 0.016 × 0.2 = 0.05952~~
~~0.0688 + 0.016 × 0.2 = 0.072~~
~~0.5952 + 0.016 × 0.4 = 0.0688~~

For (O) (2nd time) range d = 0.0688 - 0.0624
= 0.0064

R = ll + d × P(n)

0.0624 + 0.0064 × 0.2 = 0.06368
0.06368 + 0.0064 × 0.2 = 0.06496,
0.06496 + 0.0064 × 0.4 = 0.06752
0.06752 + 0.0064 × 0.2 = 0.0688

For (F) range d = 0.0688 - 0.06752 = 0.00128.

0.06752 + 0.00128 × 0.2 = 0.067776
0.067776 + 0.00128 × 0.2 = 0.068032
0.068032 + 0.00128 × 0.4 = 0.068544
0.068544 + 0.00128 × 0.2 = 0.0688

Final Ans is lower value of last alphabet.

For (O) range {First Time} = 0.072 - 0.056.
= 0.016.

0.056 + 0.016 × 0.2 = 0.0592
0.0592 + 0.016 × 0.2 = 0.0624
0.0624 + 0.016 × 0.4 = 0.0688
0.0688 + 0.016 × 0.2 = 0.072

Ans 3) $S = \underbrace{111111111111111}_{(15)}\ \underbrace{00000000000000000000}_{(20)}\ \underbrace{1111}_{(4)}$

It can be coded using Run-length coding as.

$\underset{(5)}{(1111, 1)}, \underset{(6)}{(10011, 0)}, \underset{(4)}{(100, 1)}$

compressing ratio is the ratio between the no. of bit required after encoding to the no. of bits required before encoding ie for the orignal message.

Here compression ratio = $\frac{15}{39}$ = ~~0.38461~~

$\boxed{\frac{15}{39} = 0.3846}$

Ans 2) "banana-badadaa"

Let dictionary be assigned as:-

b : 0
a : 1
n : 2
- : 3
d : 4

Input	Current Str.	Seen	Encoded	New dict
b	b	Yes	–	
b|a	ba	NO	0	ba|5
ba|n	an	NO	0,1	an|6
ban|a	na	NO	0,1,2	na|7
bana|n	an	yes	0,1,2,6	–
banan|a	na	Yes	0,1,2,6,7	–
banana|-	a-	No	0,1,2,6,7,1	a-|8
banana-|b	-b	NO	0,1,2,6,7,1,3	-b|9
banana-b|a	ba	Yes	0,1,2,6,7,1,3,5	–
banana-ba|d	ad	NO	0,1,2,6,7,1,3,5,1	ad|10
banana-bad|a	da	No	0,1,2,6,7,1,3,5,1,4	da|11
banana-bada|d	ad	Yes	0,1,2,6,7,1,3,5,1,4,10	–
banana-badad|a	da	Yes	0,1,2,6,7,1,3,5,1,4,10,11	–
banana-badada|a	aa	NO	0,1,2,6,7,1,3,5,1,4,10,11,1	aa|12
banana-badadaa	–	Yes.	0,1,2,6,7,1,3,5,1,4,10,11,1,12	

Ans- L2W of "banana-badadaa" is.

$$\boxed{0,1,2,6,7,1,3,5,1,4,10,11,1,12}$$

$$\text{Efficiency} = \frac{\text{Available}}{\text{Encoded}} = \frac{12}{14} = 0.8571$$

$$= 85.71\%$$