Q1(a) Top down Parsing (Depth first strategy)

₁The ₂young ₃women ₄cried

Step	Current state	Backup state	Comment	Grammar
				S → NP VP
1	((S) 1)			NP → ART N
				NP → ART ADJ N
2	((NP VP) 1)			VP → V
				VP → V NP
3	((ART N VP) 1)	((ART ADJ N VP) 1)		cried : V
4	((N VP) 2)	((ART ADJ N VP) 1)	"The : Art	dogs : N, V
5	((VP) 3)	~~((V NP) 3)~~		The : Art.
		((ART ADJ N VP) 1)		young : ADJ, N
6	((V) 3)	((V NP) 3)		women : N, V
		((ART ADJ N VP) 1)		
7.	(( ) 4)	((V NP) 3)		
		((ART ADJ N VP) 1)		
8	((V NP) 3)	((ART ADJ N VP) 1)		
9	((NP) 4)	((ART ADJ N VP) 1)		
10	((ART N) 4)	((ART ADJ N) 4)		
		((ART ADJ N VP) 1)		
11	((ART ADJ N) 4)	((ART ADJ N VP) 1)		
12	((ART ADJ N VP) 1)			
13	((ADJ N VP) 2)			
14	((N VP) 3)			
15	((VP) 4)			
16	((V) 4)	((V NP) 4)		
17	(( ) 5)	success.		

Ans 1(b) CKY parsing

the man hit the dog

S → np vp
np → det n   the → hit
det → the
n → men
n → dog
vp → tv, np

	1	2	3	4	5
0	det ← np ←				S
1		n			vp
2			tv ←	det ← np.	
3					n
4					

the   men   hit   the   dog

Qus 2 (a) He gave her a pen

Stack	Buffer	Arcs.	Operations
[ ]ₛ	[He,gave, her, a, pen, .]ᵦ		SH.
[He]ₛ	[gave, her, a, pen, .]ᵦ	He ⟵ˢᴮᴶ gave	LA
[ ]ₛ	[gave, her, a, pen, .]ᵦ		SH
[gave]ₛ	[her, a, pen, .]ᵦ	gave ⟶ᴵᴼᴮᴶ her	RA
[gave, her]ₛ	[a, pen, .]ᵦ		SH
[gave, her, a]ₛ	[pen, .]ᵦ	a ⟵ᴰᵉᵗ pen	LA
[gave, her]	[pen, .]ᵦ		RE
[gave]ₛ	[pen, .]ᵦ	gave ⟶ᴼᴮᴶ pen	RA
[gave, pen]ₛ	[.]ᵦ		RE
[gave]ₛ	[.]ᵦ	gave ⟶ᵖᵘⁿᶜ .	RA
[gave, .]ₛ	[ø]ᵦ → empty		

2b) See the slides

Ans 3.

3 gram	count	2 gram	count	1 gram	count
A beautiful day	5	beautiful day	7	day	20
A beautiful night	0	beautiful night	0	night	5

- P_{bd} (day | a beautiful) $= \frac{5}{5} - \frac{1}{8} = 1 - \frac{1}{8} = \frac{7}{8}$

P_{nd} (night | a beautiful) $= \lambda_1 \cdot P$ (night | beautiful)

P (night | beautiful) $= \lambda_2 \, P$ (night)

P (night) $= \frac{5}{25} - \frac{1}{8} = \frac{3}{40} = 0.075$

P (night | beautiful) $+ P$ (day | beautiful) $= 1$

$\frac{3\lambda_2}{40} + \left(1 - \frac{1}{8}\right) = 1$

$\frac{3\lambda_2}{40} = \frac{1}{8}$

$\lambda_2 = \frac{5}{3} =$

$\lambda_2 \, P$ (night) P (night | beautiful) $= \lambda_2 \, P$ (night)

$= \frac{5}{3} \left[\frac{5}{25} - \frac{1}{8} \right]$

$= \frac{5}{3} \times \left[\frac{3}{40} \right] = \frac{1}{8}$

PTO

Ans 3

3 gram	
A beautiful	
dey	
r	

Ans 3 contd

$$P(\text{dey} \mid \text{a beautiful}) + P(\text{night} \mid \text{a beautiful})$$
$$= 1$$

$$\frac{7}{8} + \frac{d_1}{8} = 1$$

$$7 + d_1 = 8$$

$$\boxed{d_1 = 1}$$

$$P_{nd}(\text{night} \mid \text{a beautiful}) = d_1 \, P(\text{night} \mid \text{beautiful})$$
$$= \frac{1}{8}$$

$$P(\text{dey} \mid \text{a beautiful}) = \frac{7}{8}$$

next word should be "dey"

Ans 3

(i) A stone smelled the color blue :- Lexically
& syntactically correct but sementically
in correct

(ii) Its kynd of a → Lexically incorrect

Determine: 0.05×0.05
$= 0.0025$

Verb: 0.05×0.05
$= 0.0025$

Noun 0.9×0.9
$= 0.81$

Bob

max $\begin{cases} 0.0025 + 0.1 \cdot 0.9 \ (Det) \\ 0.0025 \times 0.1 \times 0.9 \ (Verb) \\ 0.81 \times 0.8 + 0.9 \ (Noun) \\ = 0.5832 \end{cases}$

max $\begin{cases} 0.0025 \times 0.8 + 0.05 \ (Det) \\ 0.0025 \times 0.1 + 0.05 \ (Verb) \\ 0.81 + 0.1 + 0.05 \ (Noun) \\ = 0.04405 \end{cases}$

max $\begin{cases} 0.0025 \times 0.1 + 0.05 \ (Det) \\ 0.0025 + 0.8 \times 0.05 \ (Verb) = 0.0001 \\ 0.81 \times 0.1 + 0.05 \ (Noun) = 0.04405 \ (N) \end{cases}$

ate

max $\begin{cases} 0.5832 + 0.1 + 0.05 \ (Det) \\ 0.04405 \times 0.1 + 0.05 \ (Verb) \\ 0.04405 \times 0.8 + 0.05 \ (Noun) \end{cases}$

max $\begin{cases} 0.5832 + 0.8 + 0.9 \ (Det) \\ 0.04405 \times 0.1 + 0.9 \ (Verb) \\ 0.04405 \times 0.1 + 0.9 \ (Noun) \end{cases}$

max $\begin{cases} 0.5832 + 0.1 + 0.05 \ (Det) \\ 0.04405 + 0.2 + 0.05 \ (Verb) \\ 0.04405 + 0.1 \ 0.05 \ (Noun) \end{cases}$

the

max $\begin{cases} 0.002916 + 0.1 + 0.05 \ (Det) \\ 0.41994 + 0.1 + 0.05 \ (Verb) \\ 0.002916 + 0.8 + 0.05 \ (Noun) \end{cases}$

max $\begin{cases} 0.002916 + 0.8 + 0.05 \ (Det) \\ 0.41994 + 0.1 + 0.05 \ (Verb) \\ 0.002916 + 0.1 + 0.05 \ (Noun) \end{cases}$

max $\begin{cases} 0.002916 + 0.1 + 0.9 \ (Det) \\ 0.41994 + 0.8 + 0.9 \ (Verb) \\ 0.002916 + 0.1 + 0.9 \ (Noun) \end{cases}$

fruit

Soln : The best sequence
is Noun Det Verb Noun.