Name: Teng Siong(T.S) Yeap
IST 664: Homework3

Part 1

Sentence:

Using the original “camelot_grammar”, the first three sentences are:
“Arthur is the king .”,
“Arthur rides the horse near the castle .” and
“Arthur rides the plodding horse near the castle .”

Tree:

['Arthur', 'is', 'the', 'king', '.']

```
(START
  (S1
    (NP (Proper Arthur))
    (VP (VerbT is) (NP (Det the) (NP (Noun king))))
    (Eos .)))
```

['Arthur', 'rides', 'the', 'horse', 'near', 'the', 'castle', '.']

```
(START
  (S1
    (NP (Proper Arthur))
    (VP
      (VerbT rides)
      (NP
        (Det the)
        (NP
          (Noun horse)
          (PP (Prep near) (NP (Det the) (NP (Noun castle)))))))
    (Eos .)))
```

```
(START
  (S1
    (NP (Proper Arthur))
    (VP
      (VerbT rides)
      (NP (Det the) (NP (Noun horse)))
      (PP (Prep near) (NP (Det the) (NP (Noun castle)))))
    (Eos .)))
```

```
(START
  (S1
    (NP (Proper Arthur))
    (VP (VerbT rides) (NP (Det the) (NP (Noun horse))))
    (PP (Prep near) (NP (Det the) (NP (Noun castle))))
    (Eos .)))
```

['Arthur', 'rides', 'the', 'plodding', 'horse', 'near', 'the', 'castle', '.']

```
(START
  (S1
    (NP (Proper Arthur))
    (VP
      (VerbT rides)
```

```
     (NP
       (Det the)
       (NP
         (Adj plodding)
         (NP
           (Noun horse)
           (PP (Prep near) (NP (Det the) (NP (Noun castle))))))))
   (Eos .)))
(START
  (S1
    (NP (Proper Arthur))
    (VP
      (VerbT rides)
      (NP (Det the) (NP (Adj plodding) (NP (Noun horse))))
      (PP (Prep near) (NP (Det the) (NP (Noun castle)))))
    (Eos .)))
(START
  (S1
    (NP (Proper Arthur))
    (VP
      (VerbT rides)
      (NP (Det the) (NP (Adj plodding) (NP (Noun horse)))))
    (PP (Prep near) (NP (Det the) (NP (Noun castle))))
    (Eos .)))
```

Rule:
(default)

Explanation:
For sentence “Arthur rides the horse near the castle”, it has three parse trees because of the rule NP VP PP Eos, NP VP (VerbT NP) Eos, and NP VP (VerbT NP PP) Eos.

For sentence “Arthur rides the plodding horse near the castle”, it has three trees as well. This is because the rules NP VP PP, VerbT NP and VerbT NP PP.

Sentence:
The next two Sentences (similar structure):
the Holy_Grail is a chalice .
the sensational Holy_Grail is a sacred chalice .

Tree:
['the', 'Holy_Grail', 'is', 'a', 'chalice', '.']

```
(START
  (S1
    (NP (Det the) (NP (NPN Holy_Grail)))
    (VP (VerbT is) (NP (Det a) (NP (Noun chalice))))
```

```
   (Eos .)))
['the', 'sensational', 'Holy_Grail', 'is', 'a', 'sacred', 'chalice', '.']
(START
  (S1
    (NP (Det the) (NP (Adj sensational) (NP (NPN Holy_Grail))))
    (VP
      (VerbT is)
      (NP (Det a) (NP (Adj sacred) (NP (Noun chalice)))))
    (Eos .)))
```

Rule:
Changed the tag to NPN which stands for non-people noun for “Holy_Grail”.
Added NPN under NP.

Explanation:
Both sentences have similar structure. The only difference in these two sentences is the second sentence has an adjective before the noun or non-people noun.

Sentence:
every coconut was carried to the hottest mountains

Tree:

```
(START
  (S1
    (NP (Det every) (NP (Noun coconut)))
    (VP
      (VpastT was)
      (VP
        (VpastP carried)
        (PP
          (TOwork
            (TO to)
            (NP
              (Det the)
              (NP (SuperAdj hottest) (NP (Nplural mountains))))))))
    (Eos .)))
```

Rule:
Changed tag to VpastT for verb (past tense).
Changed tag to VpastP for verb (past participle).
Changed tag to SuperAdj for Superlative adjectives.
Changed tag to Nplural for Plural nouns.
Added SuperAdj NP | Nplural under NP.
Added VpastT VP | VpastP PP under VP.
Added TOwork under PP.
Added a new non-terminal symbol: TOwork -> TO NP.

Explanation:
There are two verbs “was” and “carried” in this sentence. The first verb “was” is a past tense of a verb “to be”. A verb followed by a verb “to be” is a verb past participle. “to the hottest mountains” seems like a prepositional clause. So, I set new rules VpastT VP and VpastP PP under VP.

Sentence:
sixty strangers are at the Round_Table .

Tree:
```
(START
  (S1
    (NP (NUM sixty) (NP (Nplural strangers)))
    (VP
      (VPPT are)
      (PP (Prep at) (NP (Det the) (NP (NPN Round_Table)))))
    (Eos .)))
```

Rule:
Changed tag to VPPT for verb (present, plural, third person).
Added VPPT PP under VP.
Added NUM NP under NP.

Explanation:
The sentence is constructed by NP VP. In NP part, there is a numeric word which I tag it as NUM and a non-people noun (NPN). In VP part, it contains a VPPT and a PP because the prepositional clause goes with the verb “are” but not “sixty strangers”.

Sentence:
Sir_Lancelot might have spoken .

Tree:
```
(START
  (S1
    (NP (Proper Sir_Lancelot))
    (VP (aux might) (VP (Vbase have) (VP (VpastP spoken))))
    (Eos .)))
```

Rule:
Changed tag to aux for modals.
Changed tad to Vbase for all base form verbs.
Added aux VP | Vbase VP | VpastP under VP rule.

Explanation:
"might" is an auxiliary verb. The verb that follows by the auxiliary verb is the base form verb. I set the rule as aux VP | Vbase VP | VpastP because the verb after the verb "have" must be past participle.

Sentence:
Guinevere had been riding with Patsy for five weary nights .

Tree:
```
(START
  (S1
    (NP (Proper Guinevere))
    (VP
      (VpastT had)
      (VP
        (VpastP been)
        (VP
          (V-ing riding)
          (PP
            (Prep with)
            (NP
              (Proper Patsy)
              (PP
                (Prep for)
                (NP
                  (NUM five)
                  (NP (Adj weary) (NP (Nplural nights)))))))))
    (Eos .)))
(START
  (S1
    (NP (Proper Guinevere))
    (VP
      (VpastP had)
      (VP
        (VpastP been)
        (VP
          (V-ing riding)
          (PP
            (Prep with)
            (NP
              (Proper Patsy)
              (PP
                (Prep for)
                (NP
                  (NUM five)
                  (NP (Adj weary) (NP (Nplural nights)))))))))
```

```
   (Eos .)))
(START
  (S1
    (NP (Proper Guinevere))
    (VP
      (VpastT had)
      (VP
        (VpastP been)
        (VP (V-ing riding) (PP (Prep with) (NP (Proper Patsy))))))
    (PP
      (Prep for)
      (NP (NUM five) (NP (Adj weary) (NP (Nplural nights)))))
    (Eos .)))
(START
  (S1
    (NP (Proper Guinevere))
    (VP
      (VpastP had)
      (VP
        (VpastP been)
        (VP (V-ing riding) (PP (Prep with) (NP (Proper Patsy))))))
    (PP
      (Prep for)
      (NP (NUM five) (NP (Adj weary) (NP (Nplural nights)))))
    (Eos .)))
```

Rule:

Changed tag to V-ing for present participle verb.
Added VpastP VP | V-ing PP under VP
Added Proper PP under NP rule.

Explanation:

I do not particularly like this parse tree because the prepositional attachment is not correct. This is because one of the pre-established rules, S -> NP VP PP.

"had" is a past tense word and the word after that word must be past participle word. In this case, it is "been" follows by a present participle word "riding.

Sentence:

Sir_Bedevere might have been suggesting this quest .

Tree:

```
(START
  (S1
    (NP (Proper Sir_Bedevere))
    (VP
```

```
    (aux might)
    (VP
      (Vbase have)
      (VP
        (VpastP been)
        (VP (V-ing suggesting) (NP (Det this) (NP (Noun quest)))))))
  (Eos .)))
```

Rule:
V-ing NP under VP.

Explanation:
Like the previous sentence, however, this time, the V-ing follows by a NP instead of a PP.

Sentence:
the Britons migrate south frequently .

Tree:

```
(START
  (S1
    (NP (Det the) (NP (properS Britons)))
    (VP (VPPT migrate) (Adv south) (Adv frequently))
    (Eos .)))
```

Rule:
Changed the tag to properS for Plural proper nouns
Changed the tag to Adv for adverbs
Added VPPT Adv Adv under VP
Added properS under NP

Explanation:
Adverbs are used to describe the verb. In this case, there are two adverbs sitting next to each other. Thus, the rule VPPT Adv Adv. The reason VPPT is used instead of Vbase is because "migrate" in this sentence is a plural, present, third person verb.

Sentence:
Arthur and Guinevere ride frequently near the castle .

Tree

```
(START
  (S1
    (NP (Proper Arthur) (Conj and) (Proper Guinevere))
    (VP
      (VPPT ride)
      (Adv frequently)
```

```
    (PP (Prep near) (NP (Det the) (NP (Noun castle)))))
  (Eos .)))
```

Rule:
Changed tag to Conj for Coordinating conjunctions
Added VPPT Adv PP under VP
Added Proper Conj Proper under NP

Explanation:
"Arthur" and "Guinevere" are connected by the conjunction "and".

Sentence:
he suggests to grow fruit at home .

Tree:

```
(START
  (S1
    (NP (pronoun he))
    (VP
      (Vsingular suggests)
      (TOwork
        (TO to)
        (VP
          (Vbase grow)
          (NP (Noun fruit))
          (PP (Prep at) (NP (Noun home))))))
    (Eos .)))
```

Rule:
Changed tag to pronoun for personal pronoun
Changed tag to Vsingular for third person singular verbs
Added Vsingular TOwork | Vbase NP PP under VP
Added pronoun under NP
Added TO VP under TOwork

Explanation:
TO in this case is special. It is in the form of VP TO VP, where the VP after TO is a Vbase.

Sentence:
riding to Camelot is not hard .

Tree:

```
(START
  (S1
    (NP (V-ing riding) (PP (TOwork (TO to) (NP (NPN Camelot)))))
    (VP (VerbT is) (NOTwork (NOT not) (Adj hard)))
    (Eos .)))
```

Rule:

Added VerbT NOTwork under VP
Added V-ing PP under NP
Added new non terminal symbol: NOTwork -> NOT Adj

Explanation:

"Riding" is this sentence is a very unique example where it seems like a verb but it is a noun.

Sentence:

do coconuts speak ?

Tree:

```
(START
  (S1
    (DO do)
    (S1 (NP (Nplural coconuts)) (VP (Vbase speak)) (Eos ?))))
```

Rule:

Added DO S1 under S1
Added Vbase under VP

Explanation:

I treat DO as a special case where I added the non-terminal symbol in front of S1.

Sentence:

why does England have a king ?

Tree:

```
(START
  (S1
    (WHadv why)
    (S1
      (DO does)
      (S1
        (NP (NPN England))
        (VP (Vbase have) (NP (Det a) (NP (Noun king))))
        (Eos ?)))))
```

Rule:
Changed tag to WHadv for Wh-adverbs
Added WHadv S1 under S1
Added Vbase NP under VP

Explanation:
Like the previous sentence, I add WHadv S1 which further breakdowns to DO S1, and eventually become NP VP Eos. Then I add Vbase NP because the verb after "do" or "does" must be the root verb.

Challenge Sentence #1:
unfortunately , Sir_Lancelot speaks again .

Tree:
```
(START
  (S1
    (Adv unfortunately)
    (pause ,)
    (S1
      (NP (Proper Sir_Lancelot))
      (VP (Vsingular speaks) (Adv again))
      (Eos .))))
```

Rule:

Changed to "pause" tag for pauses
Added Adv pause S1 under S1
Added Vsingular Adv under VP

Explanation:
Speaking of sentence structure, it makes more sense to add a rule from the sentence level. I choose to add Adv pause S1 under S1. "Adv" will take care of "unfortunately", "pause" will do the same for "," and S1 will eventually become NP VP Eos which will parse "Sir_Lancelot speaks again ."

Challenge Sentence #2:

who does Arthur suggest she carry ?

Tree:

```
(START
  (S1
    (WHpronoun who)
    (S1
      (DO does)
      (S1
        (NP (Proper Arthur))
        (VP
          (Vbase suggest)
          (S (NP (pronoun she)) (VP (Vbase carry))))
        (Eos ?)))))
```

Rule:

Changed to "WHpronoun" tag
Added WHpronoun S1 under S1
Added Vbase S under VP
Added a new non-terminal: S -> NP VP

Explanation:

I label the WH-pronoun tag as WHpronoun. In a sentence structure, I set a rule WHpronoun S1 under S1. WHpronoun will take care of the "who" and S1 rule will loop over DO S1, NP VP Eos. At the end of this sentence, we have a clause "she carry" which is independent. Therefore, I create a new non-terminal symbol S which contains S -> NP VP.

Challenge Sentence #3:

Arthur rode to Camelot and drank from his chalice .

Tree:

```
(START
  (S1
    (NP (Proper Arthur))
    (VP (VpastT rode) (PP (TOwork (TO to) (NP (NPN Camelot)))))
    (Conj and)
    (VP
      (VpastT drank)
      (PP (Prep from) (NP (PPP his) (NP (Noun chalice)))))
    (Eos .)))
```

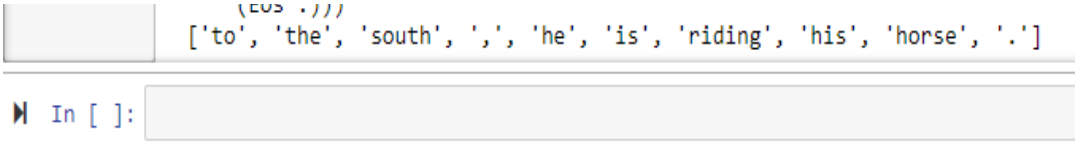
Rule:
Changed tag to PPP for Possessive personal pronouns.
Added PPP NP under NP.
Added VpastT PP under VP
Added NP VP Conj VP Eos under S1

Explanation:
The whole sentence is constructed by a NP, a VP, a conjunction, and a VP. So, I wrote a new rule (stated above) under S1. Next, I added PPP NP to accommodate "his chalice" and VpastT PP to accommodate the two verb phrases in this sentence.

Part 2

1. **Sentence:**
   to the south , he is riding his horse .

   Explanation:
   The first part of the sentence "to the south ," is not in my grammar so it can not be parsed.



2. **Non-English Sentence:**
   having to had have had .

   Tree:

```
(START
  (S1
    (NP
      (V-ing having)
      (PP (TOwork (TO to) (VP (VpastT had) (VP (Vbase have))))))
    (VP (VpastP had))
    (Eos .)))
(START
  (S1
    (NP (V-ing having) (PP (TOwork (TO to) (VP (VpastP had)))))
    (VP (Vbase have) (VP (VpastP had)))
    (Eos .)))
(START
```

```
(S1
  (NP
    (V-ing having)
    (PP (TOwork (TO to) (VP (VpastP had) (VP (Vbase have))))))
  (VP (VpastP had))
  (Eos .)))
```

Explanation:

There are several causes to allow the overgeneralization to occur. First, let's have a look at the "NP" of the sentence. The V-ing PP rule allows TOwork rule and becomes TO VP at the end. In the "VP" perspective, I have VpastT VP | Vbase VP | Vbase | VpastP, these rules allow several combinations of the parse tree that are shown above because "had" can be both past tense verb and past participle verb.