Assignment

Question

A. Create a full factorial design for a product with 5 attributes and 2 levels each. Level for each attribute can be labelled 1 and 2.

B. Create an orthogonal design, how many profiles are there?

C. What is the consumers' willingness to pay for color given the following output of a conjoint analysis. Price has three levels and color has two levels. Price levels are 50, 100, and 150. Color levels are Black and White.

The coefficients estimated by caModel function are given below.

Price 50 7.8

Price 100 0.8

Colour Black 1.4

Answer

Part A

I will choose **"Air conditioner"** as the product to work with this assignment.

Following are the 5 attributes of **"Air conditioner"** :

1. Energy star rating
2. Fan speed
3. Air direction
4. Filter type
5. Brand

Each of the above attributes will have 2 levels each. Since each attributes has 2 levels, the full profile will have 32 profiles. I will use the conjoint R library to find the solution.

```
library(conjoint)
```

```
## Warning: package 'conjoint' was built under R version 3.3.3
```

```
##
## This is package 'modeest' written by P. PONCET.
## For a complete list of functions, use 'library(help = "modeest")' or 'help.start()'.
```

```
energyStar <- c("1", "2")
fanSpeed <- c("1", "2")
airDirection <- c("1", "2")
filterType <- c("1", "2")
brand <- c("1", "2")

fullProfile <-
      expand.grid(energyStar, fanSpeed, airDirection, filterType, brand)

colnames(fullProfile) <-
      c("energyStar",
      "fanSpeed",
      "airDirection",
      "filterType",
      "brand")
#View(fullProfile)

caFactorialDesign(fullProfile, type = "full") -> fullFactorialDesign

# The following is the Full factorial design for Air conditioner
fullFactorialDesign
```

```
##    energyStar fanSpeed airDirection filterType brand
## 1           1        1            1          1     1
## 2           2        1            1          1     1
## 3           1        2            1          1     1
## 4           2        2            1          1     1
## 5           1        1            2          1     1
## 6           2        1            2          1     1
## 7           1        2            2          1     1
## 8           2        2            2          1     1
## 9           1        1            1          2     1
```

```
## 10          2          1          1          2      1
## 11          1          2          1          2      1
## 12          2          2          1          2      1
## 13          1          1          2          2      1
## 14          2          1          2          2      1
## 15          1          2          2          2      1
## 16          2          2          2          2      1
## 17          1          1          1          1      2
## 18          2          1          1          1      2
## 19          1          2          1          1      2
## 20          2          2          1          1      2
## 21          1          1          2          1      2
## 22          2          1          2          1      2
## 23          1          2          2          1      2
## 24          2          2          2          1      2
## 25          1          1          1          2      2
## 26          2          1          1          2      2
## 27          1          2          1          2      2
## 28          2          2          1          2      2
## 29          1          1          2          2      2
## 30          2          1          2          2      2
## 31          1          2          2          2      2
## 32          2          2          2          2      2
```

Part B

The following R code will generate the orthogonal design.

```
caFactorialDesign(fullProfile, type = "orthogonal") -> orthogonalDesign

# Follwing is the orthogonal design

orthogonalDesign
```

```
##    energyStar fanSpeed airDirection filterType brand
## 3           1        2            1          1     1
## 6           2        1            2          1     1
## 9           1        1            1          2     1
## 16          2        2            2          2     1
## 18          2        1            1          1     2
## 23          1        2            2          1     2
## 28          2        2            1          2     2
## 29          1        1            2          2     2
```

```
# To show that its orthogonal, meaning they are independent
cor(caEncodedDesign(orthogonalDesign))
```

```
##              energyStar fanSpeed airDirection filterType brand
## energyStar            1        0            0          0     0
## fanSpeed              0        1            0          0     0
## airDirection          0        0            1          0     0
## filterType            0        0            0          1     0
## brand                 0        0            0          0     1
```

This Orthogonal design has **8 profiles**.

Part C

The output of caModel is given below:

- Price 50 7.8
- Price 100 0.8
- Colour Black 1.4

Therefore:

- Price 150 -8.6
- Colour White -1.4

Caculating the range of worth

- Range of worth of price: rangePrice = Max - Min = 7.8 - (-8.6) = 16.4
- Range of worth of Colour: rangeColour = 1.4 - (-1.4) = 2.8

Calulating the importance of colour

Importance of colour:

importance = rangeColour / (rangeColour + rangePrice) = 2.8 / (2.8 + 16.4) = 0.1458

Therefore, the consumers' willingness to pay for colour is **14.58%** i.e consumer is giving importance of 14.58% to colour.