**Midterm Exam**

Text questions and concerns to Farrokh Alemi at 703 893 3799.

**Instruction**

Please answer all questions. Use only this word document to provide your answers; also attach other Excel or Python files to show your work. Copy charts into this document. Make sure that charts are labeled appropriately. Copy tables into this document, format to fit the space. You can lose points if your work does not look professional. Use only black font color for text Use only one font size. Submit on time, any delay in submission will lead to 10% loss of grade; additional days of delay will lead another 10% loss of grade.

**Question 1 (5 Points):** Please give your first and last name, email and phone number?

**Question 2 (5 Points):** Plot the following data, where the X axis is the time periods (starting with period 21), the Y-axis shows the observed value, the upper control limit and the lower control limits. The first seven data points are pre-intervention. Title the chart. Create a legend that defines the name for various lines. Make sure that the observation line has markers and the control limits have no markers. Make portion of Upper and lower limit lines that are post intervention red dashed line. Make portion of the control lines that are pre-intervention red straight line. Make all upper and lower limit lines red.

|  |  |  |  |
| --- | --- | --- | --- |
| Time | Observed value | Upper limit | Lower Limit |
| 21 | 13 | 52.5 | 12.5 |
| 22 | 0 | 52.5 | 12.5 |
| 23 | 20 | 52.5 | 12.5 |
| 24 | 14 | 52.5 | 12.5 |
| 25 | 35 | 52.5 | 12.5 |
| 26 | 40 | 52.5 | 12.5 |
| 27 | 50 | 52.5 | 12.5 |
| 28 | 45 | 53.5 | 14.0 |
| 29 | 37 | 54.5 | 12.5 |
| 30 | 20 | 50.5 | 15.2 |
| 31 | 43 | 50.5 | 12.7 |
| 32 | 67 | 50.5 | 14.5 |
| 33 | 45 | 51.5 | 13.5 |
| 34 | 64 | Not Available | 11.5 |
| 35 | 43 | 53.5 | 10.5 |
| 36 | 32 | 54.5 | 12.5 |
| 37 | 52 | 50.5 | 13.5 |
| 38 | 61 | 49.5 | 12.8 |

**Question 3: (20 Points)** Construct a receiver operating curve for the following data.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | Predicted Probability of Death | | | | |
| 0 to 0.2 | 0.2 to 0.4 | 0.4 to 0.6 | 0.6 to 0.8 | 0.8 to 1 |
| True Condition | Alive | 33 | 6 | 6 | 9 | 2 |
| Dead | 3 | 2 | 2 | 11 | 33 |

**Question 4:**  **(30 points)** Given the following data, construct a measure of severity of illness from the comorbidities and predict what is the probability that a patient with MI, DM, and AA, will have a length of stay that exceeds the weighted average length of stay?

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Case** | **1st Diagnosis** | **2nd Diagnosis** | **3rd Diagnosis** | **4th Diagnosis** | **Length of stay** | **Number of Patients** |
| **Type** |
| **1** | MI | CHF | DM |  | 5.56 | 120 |
| **2** | MI |  |  | AA | 4.1 | 110 |
| **3** |  | CHF | DM | AA | 5.54 | 100 |
| **4** |  | CHF | DM |  | 3.56 | 90 |
| **5** | MI | CHF |  | AA | 7.03 | 80 |
| **6** | MI | CHF |  |  | 5.02 | 70 |
| **7** |  | CHF |  | AA | 5.04 | 60 |
| **8** | MI | CHF | DM | AA | 7.62 | 50 |
| **9** | MI |  |  |  | 2.03 | 40 |
| **10** |  | CHF |  |  | 3.03 | 30 |
| **11** | MI |  | DM |  | 2.6 | 20 |
| **12** |  |  | DM | AA | 2.57 | 10 |
| **13** |  |  | DM |  | 0.61 | 5 |
| **14** |  |  |  | AA | 2.12 | 5 |
| **15** |  |  |  |  | 0.01 | 140 |
| MI = Myocardial Infarction; CHF = Congestive Heart Failure;  DM=Diabetes Mellitus; AA=Alcohol abuse | | | | | | |

**Question 5:**  **(10 points)** Use the data provided at the link below, calculate the probability of mortality in 6 months for patients who has been hospitalized one time for salmonella meningitis (I003.21) and 3 times for Alzheimer's disease I331.0.ith

<http://openonlinecourses.com/spc/Likelihood%20Ratios%20for%20Predicting%20Prognosis.xlsx>

**Question 6:**  **(30 points)** Compare the performance of George Washington University hospital to 2 Medstar hospitals in DC on HCAHPS Star Rating since 2015.