United Arab Emirates University

STAT 101

Final Exam

Exam Code: B

30th November, 2023

Name:

Student ID:

- There are a total of 105 points in this Question Paper. Answer as much as you can. If your acquired score is greater than equal to 100 it will be counted as 100%.
- The Exam is scheduled for 120 minutes
- Students who are late by 15 minutes or more from the comencement of the exam are not be allowed to enter the room.
- A student leaving the exam hall for any reason is not allawed to return.
- Students are not allowed to leave the room before 45 minutes from the commencement of the exam.
- Students are required to carry university ID, calculator and pen/pencil to the desk.
- Electronic gadgets such as a Laptop, mobile phone, smart watch, etc. are not allowed.
- This is a closed book, closed notes exam. However, you may take help from the "Exam Assistance Note" provided along with the exam paper.

For instructor's use only

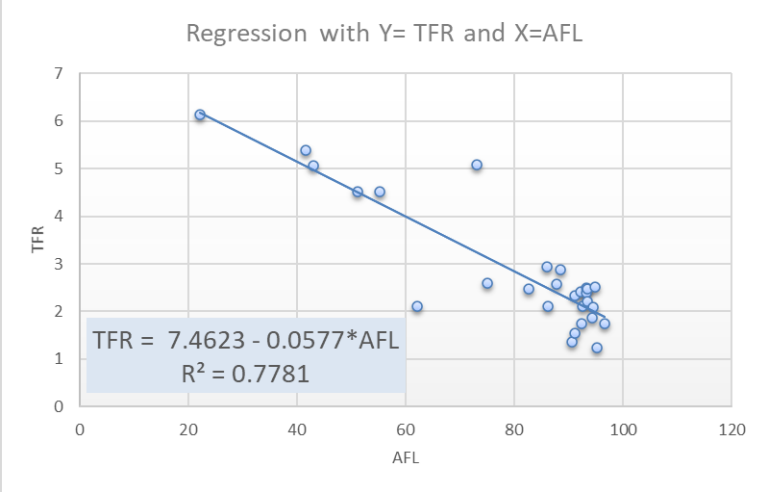
Problem Number	Obtained Score	Total Score
Problem 1		35
Problem 2		10
Problem 3		10
Problem 4		10
Problem 5		10
Problem 6		15
Problem 7		15
TOTAL		105
TOTAL(out of 100)		100

You May Use This Page for Rough Work

Part-I

Pick the correct answer option for the questions in this part of the exam.

1. (a) Consider the scatter plot and the corresponding regression line for the 'Adult Female Literacy' (x) and on 'Total Fertility Rate' (y) based on a sample of 30 countries worldwide.



Based on the information provided on the plot, what can we tell about the correlation between the two variables?

Score:
Total Score: 5

Ans: ☐ 0.882 ☐ -0.882 ☐ 0.7781 ☐ Can not be determined

(b) **Statement:** If correlation between two continuous variables is zero then the there is no relation (no linear or nonlinear relation) between the variables.

Score:
Total Score: 5

Ans: ☐ TURE ☐ FALSE

(c) If there is no linear relationship between two variables, then which value among the options below would be most appropriate about the correlation between the two variables.

Score:
Total Score: 5

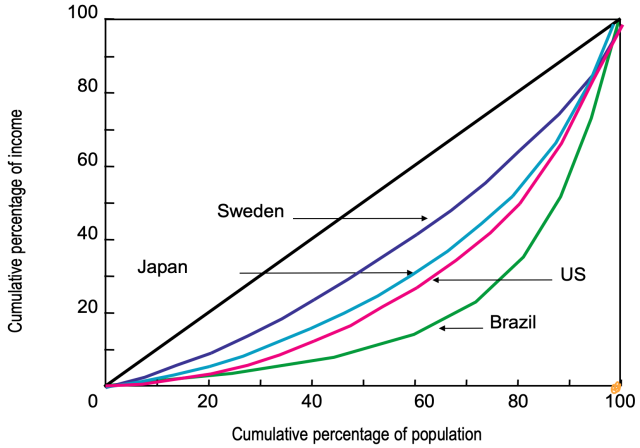
Ans: ☐ 0.957 ☐ 0 ☐ −0.971 ☐ 98.112

(d) According to the World DataBank the **Crude Birth Rate (CBR)** and the **Crude Death Rate** for the entire world in the year 2022 is given as 16.2 (per 1000 population) and 9.1 (per 1000 population). Then what is the world population growth rate (in percentages) **AGR**% in the year 2022?

Score:
Total Score: 5

Ans: ☐ 71.00% ☐ 7.10% ☐ 0.71% ☐ 0.071%

(e) Consider the Lorenz curves of wealth inequality for Brazil, Japan, Sweden, USA. Based on the plot below, which country has **highest** wealth inequality among the four?



Score:
Total Score: 5

Ans:
- [ ] Japan
- [ ] USA
- [ ] Sweden
- [ ] Brazil

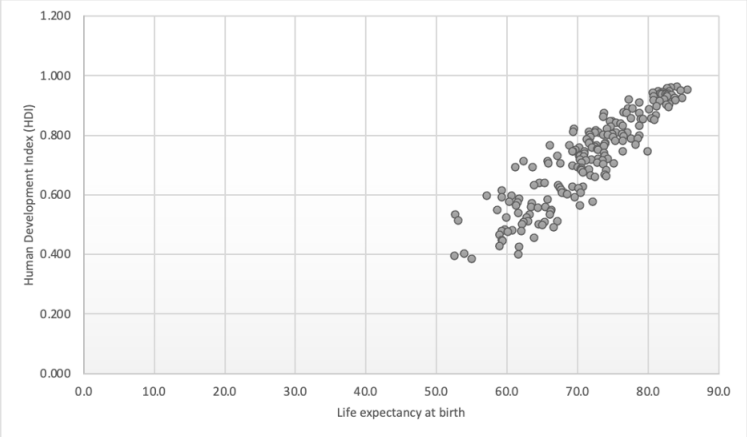
(f) Consider the histogram of the variable 'Life Expectancy at Birth' for a few countries.

Based on the provided histogram, what can we say about the type of the histogram of the variable? There may be more than one correct option. Select all that are correct.

Score:
Total Score: 5

Ans:
- [ ] Skewed Right
- [ ] Skewed Left
- [ ] Mean is smaller than Median
- [ ] Mean is larger than Median

Consider the scatter plot of the variables 'Life Expectancy at Birth' (LEB), and 'Human Development Index' (HDI) for 191 randomly selected countries.



(g) Based on the provided scatter plot what can we say regarding the nature of association between the variables LEB, and HDI. There may be more then one correct statements, select all the correct options.

Score: _____
Total Score: 5

Ans:

- [ ] There is a positive linear relationship between 'LEB' and 'HDI'
- [ ] There is a negative linear relationship between 'LEB' and 'HDI'
- [ ] As 'LEB' increases, 'HDI' decreases
- [ ] As 'LEB' increases, 'HDI' increases
- [ ] There is no relationship between 'LEB' and 'HDI'.

Part-II

Answer the following short-answer type questions.

2. (a) Assuming that the AAGR% for UAE's population remain fixed at 1.021, **calculate the Doubling Time (DT) of the UAE's population.**

Score:
Total Score: 5

(b) The Adult Female Literacy Rate (%) for a seven selected less-developed countries are provided as below:

51.2, 55.2, 62.3, 73.1, 75.0, 82.8, 84.3

What is the median of the above seven numbers?

Score:
Total Score: 5

Part-III

Answer the following questions. Show your steps to get full credit.

3. Consider the following table on world total population provided on a few years interval from 1980 to 2015

Year	World Population (in billions)
1980	4.44
1990	5.29
2000	6.12
2015	7.34

(a) Find the Average Annual Growth Rate **(AAGR%)** for world population during the period **from 1980 to the year 2015.**

Score: ____
Total Score: 5

(b) **Predict the world population in the year 2035 using 2015 as the base year.** Assume that the AAGR% for world population remains fixed at the value that you have calculated in part (a) of this problem.

Score: ____
Total Score: 5

4. To estimate the 'average life expectancy' in **less-developed countries**, a random sample of 144 less-developed countries were considered. The corresponding data summary is obtained as

Sample Size: 144, Sample Mean: 67.1, Sample Standard Deviation: 20.1

On the other hand, based on a random sample of 121 **developed countries** we obtained the following summary statistic of the corresponding data.

Sample Size: 121, Sample Mean: 76, Sample Standard Deviation: 26.4

(a) Compute the 95% confidence interval for the 'average life expectancy' in less-developed countries.

Score:
Total Score: 5

(b) Compute the 99% confidence interval for the 'average life expectancy' in developed countries.

Score:
Total Score: 5

5. The following table is a hypothetical population of 100 individuals with a maximum life span of 4 years.

x	l_x	d_x
0	100	20
1		15
2		25
3		40
4		0

(a) Complete the following table corresponding o the 'Remaining Life Expectancy' method.

Score:
Total Score: 8

x	l_x	d_x	$L_x = \frac{l_x + l_{x+1}}{2}$	T_x	$e_x = \frac{T_x}{l_x}$
0	100	20			
1		15			
2		25			
3		40			
4		0			

Here T_x denotes the reverse cumulative summation of the variable L_x.

(b) What is the 'life expectancy at birth' for this hypothetical population?

Score:
Total Score: 2

5. Consider an example of the income distribution given by.

	Income %
Income share held by lowest 20%	5
Income share held by second 20%	10
Income share held by third 20%	20
Income share held by fourth 20%	30
Income share held by highest 20%	35

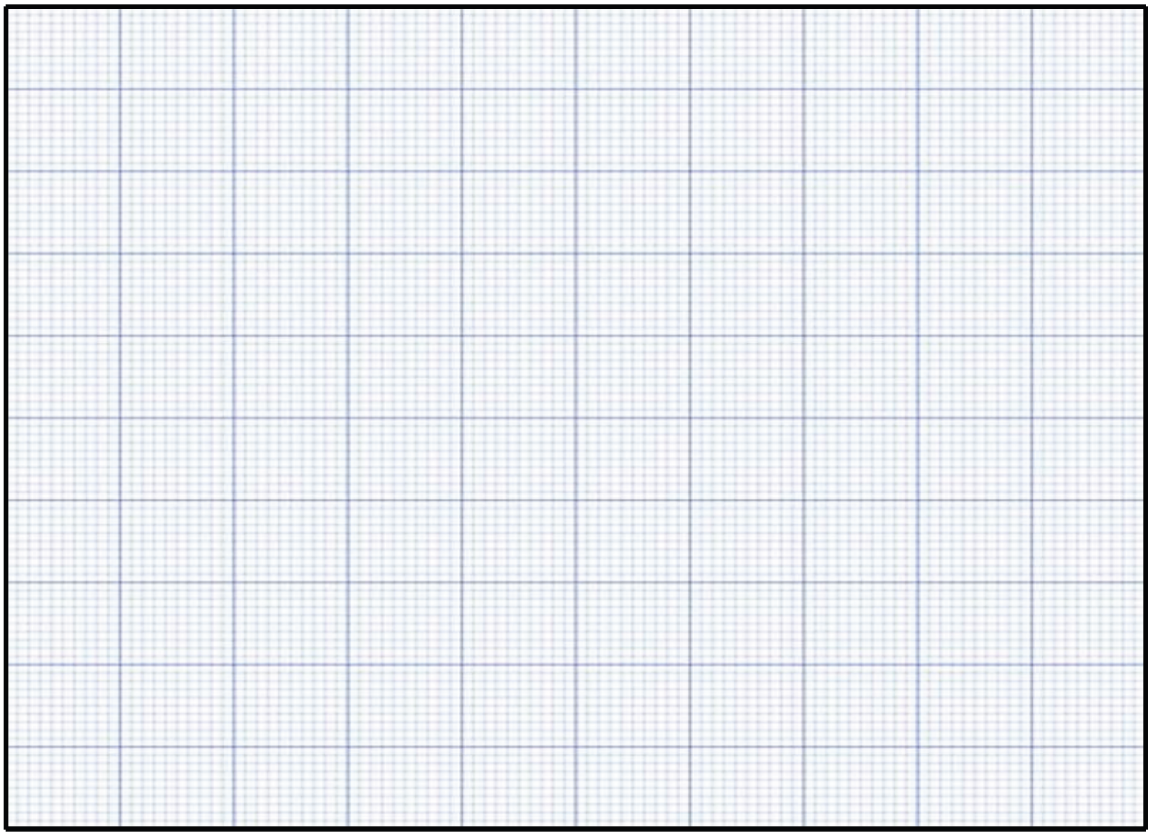
(a) Compute the table with the cumulative percentages of Income Share ans the corresponding cumulative percentages of population and complete the Table Below

Score:
Total Score: 5

Cumulative Population %	Cumulative % Income
20	
40	
60	
80	
100	

(b) Plot the Lorenz curve of Income Inequality for this hypothetical country.

Score:
Total Score: 5



(c) Compute the Gini's Index using the table provided above.

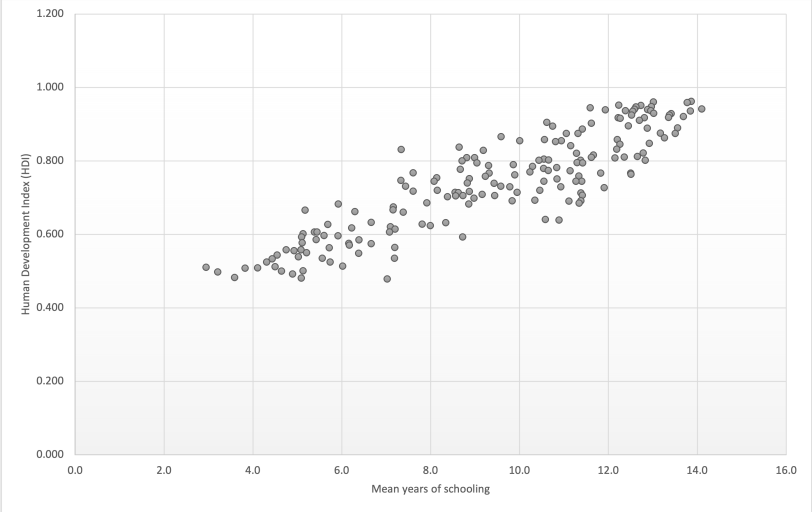
Score:
Total Score: 5

Decile	f_i	x_i	y_i	$(y_i + y_{i-1})$	$f_i \times (y_i + y_{i-1})$
20	20	5			
40	20	10			
60	20	20			
80	20	30			
100	20	35			
				Total	

Here y_i denotes the 'Cumulative % Income' share that you have computed in the previous part of the problem.

$G =$

5. Consider a data set containing two continuous variables, 'Mean years of schooling' and 'Human Development Index' (HDI) of a sample of 180 countries. For a regression model 'Human Development Index' is considered to be the response variable (Y) while the corresponding 'Mean years of schooling' (X) is used as a covariate/independent variable. The following is the scatter plot of the two variables.



Based on the data, the following summary of the variables are obtained:

	Mean years of schooling	**Human Development Index (HDI)**
Sample Mean	$\bar{X} = 9.34$	$\bar{Y} = 0.74$
Sample Standard Deviation	$S_X = 2.91$	$S_Y = 0.14$

Correlation between the variables	$r_{XY} = 0.8913$

Finally we consider a simple linear regression model: $\hat{Y} = a + bX$ where a and b denotes the intercept and the slope correspondingly. Based on the information provided, answer the following questions:

(a) Compute the value of the **slope** and provide its **interpretation**.

Score:
Total Score: 3+3

(b) Compute the value of the intercept and provide its interpretation. Is the interpretation meaningful in the context of the current example?

Score:
Total Score: 3+2+1

(c) Based on the computed regression equation, predict the 'Human Development Index' of a country for which the corresponding 'Mean years of schooling' is 10.

Score:
Total Score: 3

!!! All the Best !!!