

CERTIFIED PUBLIC ACCOUNTANT FOUNDATION LEVEL 1 EXAMINATIONS F1.1: BUSINESS MATHEMATICS AND OUANTITATIVE METHODS DATE: THURSDAY, 31 MARCH 2022

INSTRUCTIONS:

- 1. **Time Allowed: 3 hours 15 minutes** (15 minutes reading and 3 hours writing).
- 2. This examination has seven questions and only five questions should be attempted.
- 3. Marks allocated to each question are shown at the end of the question.
- 4. Show all your workings where applicable.
- 5. The question paper should not be taken out of the examination room.

F11L2022iCPARAPRIL2022iCPARAPR

QUESTION ONE

- (a) Enumerate any two rules for drawing a network of a certain project. CPARAPRI (2 Marks)
- (b) Given the following Table representing a certain project the given time estimates in weeks

Activities of the project and duration in weeks

| APR Activity ARAPRIL2022 APRIL20221 CPARAPRIL2022 APRIL20221 CPARAPRIL2022 | Optimistic time estimate (to) | Most likely time april estimate TM | Pessimistic time Parapri estimate (tp) |
|---|--|--|--|
| RAPRIL2022iCFARAPRIL2022 | CPARAPRIL2022ICPARAPRIL2022 | iCPARAPRIL2022iCPARAPrilicPARAPril 2022iCPARAPril 2022iCPARAPrilic | 2022iCPARAPRIL2022iCPARAPRI |
| RAPRIL2022id P2 RAPRIL2022 | CPARAPRIL2023CPARAPRIL2022 | | 2022iCPARAPRIL2022iCPARAI 9 |
| RAPRIL2022iqP -6 RAPRIL2022 RAPRIL2022icPARAPRIL2022 | iCPARAPRIL2022 CPARAPRIL2022 CPARAPRIL2022 | iCPARAPRIL2022iCPARAPPIL iCPARAPRIL2022iCPARAPPIL | 2022iCPARAPRIL2022iCPARAPRI 2022iCPARAPRIL2022iCPARAPRI |
| tapril2022i2parapril2022 | CPARAPRIL2022CPARAPRIL2022 | icparapril2022icparapril | 2022icparapril2022icparapri |
| Rapril2022i2 -3 rapril2022 | | icparapril2022icpara 12 1 | 2022icparapril2022icpar 48 u |
| RAPRIL 2022 i CPARAPRIL 2022 RAPRIL 2022 i CPA RAPRIL 2022 RAPRIL 2022 i CPARAPRIL 2022 | LICPARAPRIL 2022 CPARAPRIL 2022 LICPARAPRIL 2022 CPARAPRIL 2022 LICPARAPRIL 2022 CPARAPRIL 2022 | iCPARAPRIL2022iCPARAPRIL iCPARAPRIL2022iCPARAPRIL | 2022iCPARAPRIL2022iCPARAPRI 2022iCPARAPRIL2022iCPARAPRI 2022iCPARAPRIL2022iCPARAPRI |
| RAPRIL2022i3P5RAPRIL2022 | CPARAPRIL2022 CPARAPRIL2022 | iCPARAPRIL2022iCPARAPRIL | 2022iCPARAPRIL2022iCPARAPRI |
| RAPRIL2022i3P5RAPRIL2022 | CPARAPRIL2022 CPARAPRIL2022 | iCPARAPRIL2022iCPARAPIL | 2022iCPARAPRIL2022iCPARA <mark>P</mark> RI |
| (APRIL2022 i CPARAPRIL2022 RAPRIL2022 i 4-5 RAPRIL2022 PAPRIL2022 i CPARAPRIL2022 | HCPARAPRIL2022 iCPARAPRIL2022 HCPARAPRIL202 3 CPARAPRIL2022 HCPARAPRIL2023 iCPARAPRIL2023 | iCPARAPRIL2022iCPARAPRIL iCPARAPRIL2022iCPARAPRIL | 2022iCPARAPRIL2022iCPARAPRI 2022iCPARAPRIL2022iCPARAPRI 2022iCPARAPRII 2022iCPARAPRI |
| RAPRIL2022i627RAPRIL2022 | iCPARAPRIL2022CPARAPRIL2022 | iCPARAPRIL2022iCPARAPOL | 2022iCPARAPRIL2022iCPARAPRI |
| RAPRIL2022iCPARAPRIL2022 | iCPARAPRIL2022CPARAPRIL2022 | iCPARAPRIL2022iCPARAPRIL | 2022iCPARAPRIL2022iCPARAPRI |
| KAPRIL2022iOPARAPRIL2022 | icparapril2022icparapril2022icparapril2022 | TCPARAPRIL2022TCPARAPRIL | 2022iCPARAPRIL2022iCPARAPRI |
| RAPRIL2022iOPARAPRIL2022 | | TCPARAPRIL2022TCPARAP | 2022iCPARAPRIL2022iCPARAI 6 XI |
| RAPRIL2022iCPARAPRIL2022 RAPRIL2022i 7º-8 RAPRIL2022 RAPRIL2022iCPARAPRIL2022 | ALEPARAPRIL 2022 AICPARAPRIL 2022 AICPARAPRIL 2022 AICPARAPRIL 2022 | iCPARAPRIL2022iCPARA 16 L iCPARAPRIL2022iCPARAPRIL | 2022:CPARAPRIL2022:CPARAPR 2022:CPARAPRIL2022:CPARAPRI 2022:CPARAPRIL2022:CPARAPRI |

Find out:

- (i) The time estimate of activities CPARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL20(5 Marks)
- (ii) The variance and standard deviation of the project 2210PARAPRIL202210PARAPRIL20 (5 Marks)

(c) Project Manager of BC firm plan to complete project of building warehouse in 25 weeks. The project consist of nine activities (A, B. C, D, E, F, G, H and I). Table below summarize the activities, their preceding activities times and costs.

| APRIL2022iC | PARAPRIL2022iCPARAPRIL2 | Time (weeks) | ARAPRIL2022iCPAR ARAPRIL2022iCPAR | APRIL 2022 ICI Cost (FRW) PARAPK | | |
|---|---|--|---|---|------------------------|--|
| Activity | Preceding activities | D22iCPA Normal 2iCPA D22iCPA Normal 2iCPA | ARAPRI Crash PAR | APRI Normal RAP | ril20 Crash APR | |
| april2022ic Apri A 022ic | PARAPRIL2022iCPARAPRIL2 PARAPRIL2022iCPARAPRIL2 | 0221CPARAPRIL20221CP 0221CPARAPRIL 3 0221CP | ARAPRIL2022iCPAR ARAPRIL2022iCPAR | aprii 100,000 rap | 300,000 PR | |
| APRIL2022iC APRI B 022iC APRIL2022iC | PARAPRIL2022iCPARAPRIL2 PARAPRIL2022iCPARAPRIL2 PARAPRIL2022iCPARAPRIL2 | 022iCPARAPRIL2022iCP 022iCPARAPRIL 2 022iCP 022iCPARAPRIL2022iCP | ARAPRIL2022;CPAR ARAPRIL20 3 2;CPAR ARAPRIL2022;CPAR | APR 400,000 RAP | 600,000 | |
| APRIC 02210 APRIC 02210 | PARAPRIL2022iCPARAPRIL2 PARAPRIL202 A CPARAPRIL2 | 022iCPARAPRIL 2022iCPA 022iCPARAPRIL 2022iCPA | ARAPRIL2022iCPAR ARAPRIL2022iCPAR | APR 200,000 RAP | 200,000 | |
| $rac{	ext{APRIL}2022i0}{	ext{APRI}}022i0$ | PARAPRIL2022; CPARAPRIL2 PARAPRIL202 BCPARAPRIL2 | 022iCPARAPRIL2022iCP 022iCPARAPRIL 6)22iCPA | ARAPRIL2022iCPAR ARAPRIL20 4 2iCPAR | APRI 300,000 RAP | 600,000 | |
| APRILZUZZIO APRILZUZZIO APRILZUZZIO | PARAPRIL2022ICPARAPRIL2 PARAPRIL202 CCPARAPRIL2 PARAPRIL202 CCPARAPRIL2 | 022iCPARAPRILZ022iCP 022iCPARAPRIL Z 022iCP 022iCPARAPRIL Z 022iCP | ARAPRIL20221CPAR ARAPRIL20 4 21CPAR ARAPRIL20221CPAR | $^{ m APR}_{ m APR}$ 250,000 $^{ m RAP}_{ m RAP}$ | 380,000 | |
| APRIL2022io APRIL E 022io | PARAPRIL2022ICPARAPRIL2 PARAPRIL202 D CPARAPRIL2 | 0221CPARAPRIL20221CP 0221CPARAPRIL 3 0221CP | arapril2022icpar Arapril20 2 2icpar | APRI 150,000 RAP | 300,000 | |
| APRIL 2022iC APRI G 022iC APRIL 2022iC | PARAPRIL 2022 CPARAPRIL 2 PARAPRIL 2022 CPARAPRIL 2 PARAPRIL 2022 CPARAPRIL 2 | 022iCPARAPRIL2022iCP 022iCPARAPRIL 2 022iCP 022iCPARAPRIL2022iCP | ARAPRIL2022iCPAR ARAPRIL20 4 2iCPAR ARAPRIL2022iCPAR | APR 450,000 RAP | 810,000 | |
| APRIL 2022iC APRIL 2022iC | PARAPRIL2022 CPARAPRIL2 PARAPRIL2021 CPARAPRIL2 | U22iCPARAPRIL 2022iCPA U22iCPARAPRIL 2022iCPA | ARAPRIL2022iCPAR ARAPRIL2022iCPAR | APR 300,000 RAP | 360,000 | |
| APRIL <mark>2022io</mark> APRIL <mark>2</mark> 022io | parapril2022;cparapril2 parapril2 F 2 G;H ARAPRIL2 | D22iCPARAPRIL2022iCP D22iCPARAPRIL 8 022iCPA | ARAPRIL2022iCPAR ARAPRIL2052iCPAR | APRI 800,000 RAP | 128,000 | |

F1.1/120221CPARAPRIL20221CPARAPRIL20221CPARAPRIL20221CPARAPRIL20221CPARAPRIL20221CPARAPRIL20221CPARAPRIL2021CPARAPRIL2021CPARAPRIL2021CPARAPRIL2021CPARAPRIL2021CPARAPRIL2021CPARAPRIL2021CPARAPRIL2021CPARAPRIL2021CPARAPRIL20221CPARAPRIL20221CPARAPRIL20221CPARAPRIL20221CPARAPRIL20221CPARAPRIL20221CPARAPRIL20221CPARAPRIL20221CPARAPRIL20221CPARAPRIL20221CPARAPRIL20221CPARAPRIL20221CPARAPRIL20221CPARAPRIL20221CPARAPRIL2021CPARAPRIL2021CPARAPRIL2021CPARAPRIL2021CPARAPRIL2021CPARAPRIL2021CPARAPRIL2021CPARAPRIL2021CPARAPRIL2021CPARAPRIL2021CPARAPRIL2021CPARAPRIL2021CPARAPRIL2021CPARAPRIL2021CPARAPRIL2021CPARAPRIL2021CPARAPRIL2021CPARAPRIL2021CPARAPRIL2021CPARA

Required:

i) Find the total cost of performing the project in the normal time of 25 weeks. (2 Marks)

ii) Calculate the cost per week. (2 Marks)

iii) Find the critical path(s). PRIL2022iCPARAPRIL2022iCPA

iv) Find the saving that the consultancy realizes by reducing the project completion time to 16 weeks.

(Total: 20 Marks)

QUESTION TWO

(a) Discuss the four components of Time Series

(4 Marks)

(b) Output at a factory appears to vary with the day of the week. Output over the last three weeks has been as follows in the Table below:

Time series data

| PARAPRIL2022iCPARAPRIL2022iCPARAPR PARAPRIL-2022iCPARAPRIL2022iCPARAPR | IL2022iCPARAPRIL2022iC IL2022iC Week : 1 L2022iC | PARAPRIL2022iCPARAPRIL2022iCPAI PARAPRIL2022iC Week 2 L2022iCPAI | rapril2022i Cparapril: rapril2022i Week 3 1. |
|--|--|---|--|
| PARAPRIL 2022 CPARAPRIL 2022 I CPARAPR PARAPRIL 2022 I CPARAPRIL 2022 I CPARAPR PARAPRIL 2022 I CPARAPRIL 2022 I CPARAPR | units "000" 20221C | PARAPRIL2022 TPA 1000 112022 CPAI | units "000" |
| PA Monday 21CPARAPRIL20221CPARAPR | IL2022iCPARAP 80 .2022iC | PARAPRIL2022iCPARA 82 L2022iCPAI | RAPRIL2022iCPARA 84 L |
| Tuesday 2 icparapril 2022 icparapr | 1L20221CPARAF01L20221C 1L20221CPARAF04L20221C | PARAPRIL20221CPARAPRIL20221CPAI PARAPRIL20221CPARAPR O L20221CPAI | RAPRIL2022iCPARATILE RAPRIL2022iCPAR |
| Wednesday ARAPRIL 2022 iCPARAPR | IL2022iCPARAP 94 .2022iC | PARAPRIL2022iCPARAI 07 L2022iCPAI PARAPRIL2022iCPARAPRIL2022iCPAI | RAPRIL2022iCPAR100L |
| PAI Thursday CPARAPRIL2022 CPARAPR | IL2022iCPARA P20 .2022iC | parapril2022icpar 4 25 l2022icpai | rapril2022icpar 130 l |
| Pa Friday 022icparapril2022icparapr Pa Friday 022icparapril2022icparapr | 1L20221CPARAP 62 L20221C 1L20221CPARAP 62 L20221C | PARAPRIL2022iCPARAPA PARAPRIL2022iCPARAI 64 L2022iCPAI | RAPRIL2022iCPARABALI RAPRIL2022iCPARA 66 L |

Required:

Find the trend (T) and seasonal variation (Y-T) using the moving averages of 5 days method and provide a suitable interpretation arapril 2022 parapril 2022

(c) Define the exponential smoothing method and mention its two limitations (3 Marks)

(d) Consider the sales captured in table below:

Two variables' data

| A R | Week 22 icparapr | IL20221CPARAPR IL2022iCPARAPR | 12^{022} CPARAPR 12^{022} CPARAPR | 11 3 0221CPARAPE 1 3 2022iCPARAPE | 1120221CPARAPI 1120221CPARAPI | (1) 20221 CPARAPR 21 5 2022 i CPARAPR | 1160221CPARAPRI 11 6 0221CPARAPRI |
|----------|----------------------|---|--|--|----------------------------------|--|--|
| AR AR | Sales (Y_t) parapr | $11130_{21\text{CPARAPR}}^{21\text{CPARAPR}}$ | 11 70 221CPARAPR 11 70 221CPARAPR | 11 140 21CPARAPE | 1125021CPARAPE | (1 90)221CPARAPR RI 90)221CPARAPR | 1180 CPARAPRI |

Required:

(i) Use the exponential smoothing model with $\alpha = 0.3$ to predict the volume of sales for the paper above time periods. ARAPRIL 2022 CPARAPRIL 2022 CPARAPR

(ii) Compute also the forecast error parapril 2022 ic par

(Total: 20 Marks)

F1.1 L2022iCPARAPRIL202iCPARAPRIL202iCPARAPRIL2022iCPARAPRIL202iCPARAPRIL202iCPARAPRIL202iCPARAPRIL202iCPARAPRIL20

QUESTION THREE

(a) The small firm X Ltd likes to give all its workers a New Year party. The snacks are provided from X Ltd stock, but they have to buy their own drinks. They buy bottles of red and white wine (all at one price), packs of beer also all at one price and bottles of soft drinks which are also priced the same as each other. The first Christmas party was in 2010. It was a great success and so has been held every year since. We'll now look at how we can use index numbers to compare the cost for the base period of 2010 against the cost for a later period, taking the particular year of 2014.

Price index data

| RAPRIL2022;CPARAPRIL2 RAPRIL2022;CPARAPRIL2 | 022iopai Price (FRW "000"/unit) arapril | 022:CPARAPI Quantity in litre 22:CPARAPR |
|--|---|--|
| Drink 22icparapril | 0221CPARAPRIL20221CPARAPRIL20221CPARAPRIL 0221CPARAPRIL2021CPA 2014 0221CPARAPRIL2021CPA 2014 | 0221CPARAPRIL20221CPARAPRIL20221CPARAPRIL20221CPARAPRIL20221CP2014 |
| tapril 2022 i CPARAPRIL 2 RAWine 022 i CPARAPRIL 2 RAPRIL 2022 i CPARAPRIL 2 | 023iCPARAPRIL 2022iCP RAPRIL 2022iCPARAPRIL 022iCPARAPRIL202 9.3 RAPRIL2022iCPARA 4.5 L 022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL | 1022iCPARAPRIL2022iCP RAPRIL2022iCPARAPR 1022iCPARAPRIL202100 RAPRIL2022iCPARAPR 1022iCPARAPRIL2022iCPARAPRIL2022iCPARAPR |
| tapril2022:cparapril: ta Beer 022:cparapril: tapril2022:cparapril: | 022iCPARAPRIL2022iCP RAPRIL2022iCPARAPRIL 022iCPARAPRIL202 6.4 RAPRIL2022iCPARAPRIL 022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL | 10221CPARAPRIL20221CP+RAPRIL20221CPARAPR 20221CPARAPRIL20221CPARAPRIL20221CPARAPR 20221CPARAPRIL20221CPARAPRIL20221CPARAPR |
| Soft drinks ARAPRIL | 0221cparapril20225.17 rapril20221cpar.217L 0221cparapril20225.17 rapril20221cpar.27L | 2022iCPARAPRIL2022iCPARAI3 2022iCPARAPRIL2022iCPARAI3 |

Required

Compute the quantity index by using Fisher's formula from the data given in the above table

b) A workshop contains four persons available for work on the four jobs. Only one person can work on any one job. The following table shows the cost of assigning each person to each job.

| | ARAPRIL2022iCPARAPRIL2022iCPARAPRIL306iCPARAPRIL2022iCPARAPRIL2022 ARAPRIL2022iCPARAPRIL2022iCPARAPRIL3065iCPARAPRIL2022iCPARAPRIL2022 |
|---|--|
| | 4RAPRIL2022iCPARAPRIL2022iCPARAPRIL 2022 PARAPRIL2022iCPARAPRIL2022 |
| | ARAPRIL 2122 i CPARAPRIL 2022 i CPARAPRIL 2022 i CPARAPRIL 2022 i CPARAPRIL 2022 |
| | ARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022 |
| | |
| | RAPRIL 20 21 CPARAPRIL 22 21 CPARAPRIL 20 22 CPARAPRIL 20 22 CPARAPRIL 20 23 CPARAPRIL 20 24 C |
| | RAPRIL 2021CPARAPRIL 2523CPARAPRIL 2022CPARAPRIL 2022CPARA |
| RAPRIL2022iCPARAPRIL2022iCPA | ARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL20: 2 |
| RAPRIL2022iCPARAPRIL2022iCPA | ARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022 |
| | RAPRIL2022iCPARAPRIL1822iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCP17APRIL2012 |
| | ARAPRIL2 5.2 2iCPARAPRIL 1.9 22iCPARAPRIL20 2.3 iCPARAPRIL2022iCP A .RAPRIL20_2 |
| Persons 2 iCPARAPRIL 20 B iCPA | RAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL20. |
| KAPRILŻUŻ2iCPARAPRIL20 Z 2iCPA | RAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL20. |
| | RAPRIL21921CPARAPRIL17221CPARAPRIL2021CPARAPRIL20221CP24APRIL2012 RAPRIL20221CPARAPRIL20221CPARAPRIL2021CPARAPRIL20221CPARAPRIL2022 |
| | ARAPRIL2UZ2iCPARAPRIL2U22iCPARAPRIL2UZZiCPARAPRIL2U22iCIARAPRIL2UZ |
| RAPRIL2022iCPARAPRIL2022iCPA | RAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL20:2 |
| RAPRIL2022iCPARAPRIL2022iCPA | RAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL2012 |
| | RAPRIL 252 iCPARAPRIL 232 iCPARAPRIL 2021 CPARAPRIL 2021 CP24 APRIL 2021 CPARAPRIL 2021 CPARAPRI |
| RAPRIL2022iCPARAPRIL2022iCPA | ARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL2012 |
| RAPRIL2022iCPARAPRIL20 D 2iCPA | ARAPRIL20221CPARAPRIL20221CPARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022 |
| | ARAPRIL 2022;CPARAPRIL 2022;CPARAPRIL 2022;CPARAPRIL 2012; |

Required:

Use the Hungarian algorithm to assign person to jobs such that the total assignment cost is a minimum parapril 2022 icparapril 2022 icparapril

(Total: 20 Marks)

F1.1120221CPARAPRIL2021CPARAPRIL2021CPARAPRIL20221CPARAPRI

QUESTION FOUR

(a) Enumerate three properties of a Poisson distribution in probability

(3 Marks)

- **(b)** In a certain campus of University of Rwanda, the students engage in different sports in the following proportions:
 - 60 % of all students play football
 - 50 % of all students play handball
 - 30 % of all students play football and handball

Required:

If a student is selected at random, what is the probability that he/she will:

(i) Play football or handball

(2 Marks)

(ii) Play neither sport

(2 Marks)

(c) The management of Kilino photograph record company has discovered that the number of defects in records appears to follow a Poisson distribution with a mean value equal to 0.4.

Required:

(i) What is the probability that a record selected at random will have three defects?

(2 Marks)

- (ii) If the management sets a policy that all photograph record sold to customers must not have any defect, what percentage of its records production will not be made available for sales because of defects? ($e^{-4} = 0.01832$, $e^{-0.4} = 0.6703$)
- (d) The following Table 7 gives distribution of wages (in thousands FRW):

Wages distribution

| Wages per | IL2022iCPAR II 30 23 5 PAR | APRIL2022iC A 35<u>U40</u>22 iC | PARAPRIL20 P 40 4 5 1L20 | 221CPARAPR 2 45 -50 ^{APR} | L2022iCPAR L 50 2 55 PAR | APRIL20221C A 55-60 221C | PARAPRIL20: | 22iCPARAPR 265270 ^{APR} |
|--------------------|---|---|---|--|---|-------------------------------------|-------------|-------------------------------------|
| Rimonth 22iCPARAPR | IL2022iCPAR | APRIL2022iC | PARAPRIL20 | 22iCPARAPR | L2022iCPAR | APRIL2022iC | PARAPRIL20: | 22iCPARAPRI |
| No. of wages | IL2022iCPAR | APRIL2022iC APR 108 22iC | PARAPRIL20 PAP 488 1L20 | 22iCPARAPR | L2022iCPAR | APRIL2022iC APRI 3() 22iC | PARAPRIL20: | 22iCPARAPRI |
| earners 2iCPARAPR | IL2022iCPAR | APRIL2022iC | PARAPRIL20 | 22iCPARAPR | L2022iCPAR | APRIL2022iC | PARAPRIL20 | 22iCPARAPRI |

An individual is selected at random from the above group.

Required:

Find the probability that:

(i) 202 His wages are under 40 022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL20 (2 Marks)

(ii) 02 His wages are 55 or over 22iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL20(2 Marks)

(iii) His wages are either between 35-40 or 45-50 APRIL 2022 iCPARAPRIL 2022 i

(e) Given the discrete probability distribution of the random variable X represented by the table below

Random numbers distribution

| PR | v L2(|)22i | CPAF | PPR | IL20 | 221 22i | JPAI | RAPI | RIIO | 022i | CPA | RAP | RIL2 | 02710 | OP |
|----|--------------|------|------|------|------|------------|------------------|------|--------------------|------------------|-----|--------------|------|--------------------------------------|----|
| PR | i_{20} |)22i | CPAF | RAPR | IL20 | 22i | ĈPAI | RAPI | RILŽ(| 022i | CPA | RAP | RIL2 | 02 2 10 | F |
| | | | | RAPR | | | CPAI | | RIL2 |)22i | | RAP | | 022 <u>i</u> 0 | |
| | | | | APR | | | CPAI | | RIL2 | 022i | | RAP | | 022i 022 3 | |
| PR | p_{2} | | CPAF | APR | | | JP AI | | RIL 2 (|) 22i | | RAP | | 02 21 0 | T |
| PR | IL20 | | CPAL | 8APR | | | 4 A1 | | RIL2 | 5 22i | | R 8 P | | 02 21 0 02 1 i(|) |

F1.1

Required:

Calculate the mean and standard deviation of the random variable X.

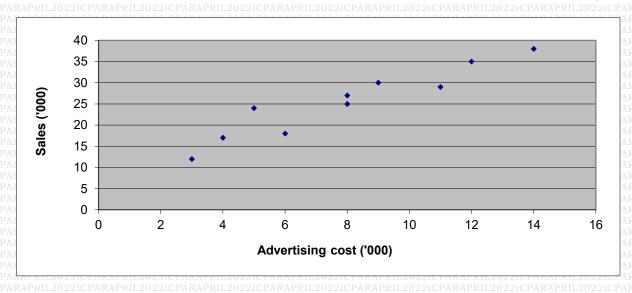
(3 Marks)

(Total: 20 Marks)

QUESTION FIVE

(a) Provide a suitable interpretation of the following scatter diagram in regression analysis

(3 Marks)



(b) A game is represented by the following pay off matrix:

Required:

Compute the value of the game and optimal strategies.

(8 Marks)

(c) Below are given the figures in Table 9 of production (in thousand quintals) of a sugar factory:

Sugar production data

| araprilizuzziopa arapr Year ziopa | RAPR 1992 | CPARAP1993 | icpara1994 | 221CPAR1995 | 022101 1996 | 2022 C 1997 R | 1998 |
|---|-----------------|---------------|--|--|---|-----------------------|--|
| ARAPRIL2022iCPA | RAPRIL2022i | CPARAPRIL2022 | 2iCPARAPRIL20 | 22iCPARAPRIL2 | 022iCPARAPRII | 2022iCPARAPR | IL2022iCPARAF |
| Production | RAPRIL 280 21 | CPARAPRIL 902 | icparapridation of the control of th | 221CPARAPRIL 221CPARAP 83 .2 | 0221CPARAPRII 0221CPARA <mark>94</mark> II | 2022iCPAI 99 R | il2022iCFARAF IL2022iCP <i>P</i> 92 if |
| ARAPRIL2022iCPA | RAPRIL2022i | CPARAPRIL2022 | CiCPARAPRIL20 | 22iCPARAPRIL2 | 022iCPARAPRII | 2022iCPARAPR | IL2022iCPARAF |
| DADDII OOOOGODA | DADDII OOOO; | CDADADDII OOO | CDADADDII OO | DOLCDADADDII O | OGG: CDADA DDII | OCCOSCDADADD | II OOOO;CDADAI |

Required:

(i) Fit a straight line trend to these figures from the Table 9

(5 Marks)

(ii) Plot these figures on a graph and show the trend line

(3 Marks)

(iii) Estimate the production in 2001

(1 Mark)

(Total: 20 Marks)

QUESTION SIX

(a) State two advantages of an arithmetic mean

(2 Marks)

(b) To demonstrate that it is providing loans to small companies Bank of people provided the following data. These data summaries the number and level of loans to companies in both Rubavu and Karongi districts.

| RAPRIL2022iCPARAPRIL2022iCF | RIL2022iCPARAPRIL2022iCPARAPRIL Number of companies RIL2022iCPARAPRIL2022iCPARAPRIL202 | | | | | |
|-----------------------------|---|--|--|--|--|--|
| Loans (FRWS 000) | parapril Parapril 2022 i Cparapri Rubavu rapril 2022 i C | parapril2022ic Karongi 022icparapr | | | | |
| 24-28)22icparapril2022icf | parapril2022icparapril202 8 icparapril2022ic | p rapril2022icpar 19 ril2022icparapr | | | | |
| 28-32022iCPARAPRIL2022iCF | PARAPRII 2022iCPARAPRIL20 41 CPARAPRIL2022iC | parapril2022icpar 36 ril2022icparapr | | | | |
| 32-36)22iCPARAPRIL2022iCF | Paraprii 2022icparapril20 27cparapril2022ic | Pirapril2022icpar 47 ril2022icparapr | | | | |
| 36-40)22iCPARAPRIL2022iCF | PARAPRII 2022ICPARAPRIL20 90 PARAPRIL2022IC | P RAPRIL20221CPARAPRIL20221CPARAPR P RAPRIL20221CPAR 5.8 RIL20221CPARAPR | | | | |
| RAO-1440221CPARAPRIL20221CF | PARAPRII 2022ICPARAPRIL20 58CPARAPRIL2022IC | P RAPRIL20221CPARAPRIL20221CPARAPR P RAPRIL20221CPARAPR | | | | |
| R44-480221CPARAPRIL20221CF | PARAPRII 2022 CPARAPRIL 2026 PARAPRIL 2022 C PARAPRII 2022 CPARAPRIL 2026 CPARAPRIL 2022 C | paraprilzuzzicpara j rilzuzzicparapr parapril2022icpar 13 ril2022icparapr | | | | |

(i) Compare the mean loan and standard deviation for both Rubavu and Karongi.

(5 Marks)

(ii) Derive the coefficient of variation for both districts.

(2 Marks)

(iii) Provide a suitable interpretation.

(2 Marks)

(c) Given the following frequency distribution

| Height (in inches) | 60-62 | 63-65 RAPRIL2022 | 66-68 RIL20221CPA | 69-71 ^{20221CPARAI} | 72-74 CPARAPR |
|----------------------|--------------|------------------|-------------------|------------------------------|------------------|
| Frequency RAPRIL 202 | 2i@PARAPRIL2 | 01 CPARAPRIL2022 | RAPRIL2022iCP | ₽ 7 RIL2022iCPARAI | PKL2022iCPARAPRI |

Required:

Coefficient of skewness (Sk = (Mean-Mode)/S.D)

(3 Marks)

N.B: Use short formula or step deviation method to shorten your computations.

(d) Mr. Nsabimana, a retired public sector servant, is considering investing his money in two proposals. He wants to choose the one that has higher average net present value and lower standard deviation. The relevant data are given below.

| A RAPRIL 2022 ICPARAPRIL 2022 ICPARAPR A RAPRIL 2022 ICPARAPRIL 2022 ICPARAPR | Net Present Value | Chance of the possible outcome |
|--|---|---|
| ARAPRIL2022iCPARAPRIL2022iCPARAPR ARAPRIL2022iCPARAPRIL2022iCPARAPR | ail2022icparapri NPV)cparapril2022ic ail2022icparapr (NPV) cparapril2022ic | parapril2022icparabril2022icparapril parapril2022ic of NPV 2022icparapril |
| Proposal Aarapril2022icparap | ilz022icparapril2022icparapri 1,559 il2022icparapril2022icparapri 1,559 | PARAPRIL2022iCPARAPRIL2022iCPA 0.30 PARAPRIL2022iCPARAPRIL2022iCPA |
| RAPRIL2022iCPARAPRIL2022iCPARAP RAPRIL2022iCPARAPRIL2022iCPARAPR | ill2022icparapril2022icparapri 5,662 0 ill2022icparapril2022icparapr 5,662 0 | PARAPRIL2022iCPARAPRIL2022iCPA 0.40 L PARAPRIL2022iCPARAPRIL2022iCPA 0.40 L |
| RAPRIL2022iCPARAPRIL2022iCPARAPR RAPRIL2022iCPARAPRIL2022iCPARAPR | IL2022iCPARAPRIL2022iCPARAPRI 92175 | PARAPRIL2022iCPARAPRIL2022iCPA 0.30 I |

and

| ARAPRIL2022iCPAR | Net Present Value | Chance of the possible |
|--|--|-----------------------------------|
| A RAPRIL2022iCPARAPRIL2022iCPARAPI | I(NPV)PARAPRIL2022iCPARAPRIL2022iCPA | outcome of NPV |
| Proposal BARAPRIL 2022 i CPARAP | IIL2022iCPARAPRIL2022iCPARAPRIL10,050 | APRIL2022iCPARAPRIL2022iCPA 0.30 |
| PAPRIL2022iCPARAPRIL2022iCPARAP | IIL2022iCPARAPRIL2022iCPARAPRIL2(5,812 | APRIL2022iCPARAPRIL2022iCPA 0.401 |
| RAPRIL2022ICT ARM RIB2022ICT ARM I | IL2022iCPARAPRIL2022iCPARAPRIL20,584 | APRIL2022iCPARAPRIL2022iCPA 0.30 |

F1. IL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL20Page 7 of 8

Required:

Help Mr. Nsabimana in choosing the appropriate proposal.

(6 Marks)

(Total: 20 Marks)

QUESTION SEVEN

(a) A firm faces the demand schedule p = 184 - 4q and the Total Cost (TC) function $TC = q^3 - 21q^2 + 160q + 40$ where q is the quantity produced.

Required:

What output will maximize the profit?

(5 Marks)

(b) Assume that the demand for oil (in millions of barrels) can be explained by the model $q = \beta x$ and the vector of coefficients of the explanatory variables has been reliably estimated as $\beta = [\beta_0 \ \beta_1 \ \beta_2 \ \beta_3 \ \beta_4 \ \beta_5] = [4.2 - 0.1 \ 0.4 \ 0.2 - 0.1 \ 0.2]$

Required:

Calculate the demand for oil when the vector of explanatory variable is

$$\begin{array}{c} 1 \\ x_1^t \\ x_2^t \\ x_3^t \\ x_4^t \\ x_5^t \end{array}) \begin{array}{c} Price \\ Price \\ Price \ of \ substitute \\ Price \ of \ complement \\ Population \ (in \ m.) \end{array}) \begin{array}{c} 1 \\ 30 \\ 18.5 \\ 52 \\ 12.8 \\ 61 \end{array}) \begin{array}{c} Price \\ Price \\ Price \ of \ complement \\ Population \ (in \ m.) \end{array}) \begin{array}{c} 1 \\ 30 \\ 18.5 \\ 52 \\ 12.8 \\ 61 \end{array}) \begin{array}{c} Price \\ Price \ of \ complement \\ Population \ (in \ m.) \end{array}) \begin{array}{c} 1 \\ 30 \\ 18.5 \\ 61 \end{array}) \begin{array}{c} Price \\ Price \ of \ complement \\ Population \ (in \ m.) \end{array}) \begin{array}{c} Price \\ Price \ of \ complement \\ Population \ (in \ m.) \end{array}) \begin{array}{c} Price \\ Price \ of \ complement \\ Price \ of \ comp$$

(c) A retailer sells two products, **Q** and **R**, in two shops **A** and **B**. The number of items sold for the last 4 weeks in each shop are shown in the two matrices **A** and **B** below, where the columns represent weeks and the rows correspond to products **Q** and **R**, respectively.

$$A = \begin{pmatrix} 5 & 4 & 12 & 7 \\ 10 & 12 & 9 & 14 \end{pmatrix}$$
 and $B = \begin{pmatrix} 8 & 9 & 3 & 4 \\ 8 & 18 & 21 & 5 \end{pmatrix}$

Required:

Derive a matrix for total sales for this retailer for these two products over the last 4 weeks.

(2 Marks)

(d) The report from JURU Ltd highlighted the fixed cost for the year February 2019 to be FRW 80,000. The estimated sales for the period are valued at FRW 200,000. The variable cost per unit for the single product made is FRW 4. if each unit sales at FRW 20 and the number of units involved coincides with the expected volume of output.

Required:

| i) | Construct the Break Even Chart (5 Marks) |
|---------------------------|--|
| Aij)RI | Determine the Break Even Point RAPRIL 2022 ICPARAPRIL 2022 ICP |
| iii) | Above how many units the company should produce in order to seek profit 11202 (1 Mark) |
| iv) | Determine the profit earned at a turn of FRW160,000 acparapril 2022 (2) Parapril 2022 (1) Mark) |
| arapri Ar v) ri | il 2022 1CParapril 20221CParapril 2 |
| | il2022icparapril2 0 22icparapril2022icparapril2022icparapril2022icparapril2022icparapril2022icparapril il2022icparapril2022icparapril2022icparapril2022icparapril2022icparapril2022icparapril2022icp a(Total: 20 Marks) |

End of Question Paper

F1.1 L2022iCPARAPRIL202iCPARAPRIL2022iCPARAPRIL202iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL2022iCPARAPRIL202iCPARAPRIL202iCPARAPRIL202iCPARAPRIL202iCPARAPRIL202iCPARAPRIL202iCPARAPRIL202iCPARAPRIL202iCPARAPRIL202iCPARAPRIL202iCPARAPRIL202iCPARAPRIL202iCPARAPRIL202iCPARAPRIL202iCPARAPR