Chhatrapati Shahu Ji Maharaj University, Kanpur

Answer Script Details
Barcode 7915670

Roll No. 22031000195
Total Mark 40/50.00

Exam BACHELOR OF SCIENCE (AG)_DEC-2023
Subject AG3003 - FUNDAMENTAL OF PLANT BREEDING (NEW

Question wise Mark Summary

Q.No	Mark	Q.No	Mark	Q.No	Mark	Q.No	Mark
1A	4/5						
1B	4/5						
1C	4/5						
1D	4/5						
1E	4/5						
1F	4/5						
2	0/10						
3	0/10						
4	8/10						
5	0/10						
6	0/10						
7	0/10						
8	8/10						
9	0/10						

Chhatrapati Shahu Ji Maharaj University
Kanpur, Uttar Pradesh

PART-II

MARKS OBTAINED										
Q.	1	2	3	4	5	6	7	8	9	10
(a)										
(b)										
(c)										
(d)										
(e)										
(f)										
(g)										
(h)										
(i)										
(j)										
Total										
Total Marks in Figures									Max. Marks	
Total Marks in Words										

Paper Code: AG3003

Signature of Evaluator

PART-I

Date of Exam: 09/12/24 Shift: 11:00-1:00 Room No.: 55

Paper Code: AG3003 Subject: Fundamentals of plant breeding 3rd

Name of Candidate: Kumar Vaibhav

Roll No. 2203100019

Signature of Candidate

Signature of Invigilator

COE Facsimile

PART-III

Course B.Sc.(Ag) 3rd Sem

Session 2023-24 Year/ Semester 3rd

Subject Name Fundamentals of plant breeding

Medium English ● Hindi ○

Paper Code: AG3003

Exam Date: 09/12/2024

Name of Candidate: KUMAR VAIBHAV

Father's Name: VINOD KUMAR VERMA

महाविद्यालय का कोड College Code: AU02

परीक्षा केन्द्र का कोड Exam Centre Code: AU02

परीक्षा का प्रकार Type of Exam: Regular ● Ex-Student ○ Private ○ Back Paper Exam ○

ANSWER BOOKLET NO. 7915670

Paper Code: AG3003

PART-IV

Enrollement Number: CSJMA220000407 12

परीक्षार्थी अनुक्रमांक संख्या Candidate's Roll Number: 2203100019

पेपर कोड Paper Code: AG3003

Signature of Candidate

Signature of Invigilator

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नोट- 1. परीक्षार्थी को निर्देशित किया जाता है कि आवरण पृष्ठ के पृष्ठ भाग पर अंकित सभी निर्देशों को सावधानी पूर्वक पढ़ें।
2. बॉक्स में भरी जाने वाली प्रविष्टियाँ काली स्याही से शुरू की जायें। 3. गोलों को काले या नीले बॉलपेन से भरा जायें।

INSTRUCTION TO THE CANDIDATE FOR FILLING PART-I

1. Read the instructions carefully given on the answer script and admit card.
2. Write **Date of Exam, Shift, Paper Code & Name of** Subject Correctly.
3. Write Name & Roll No. Correctly.
4. Write Semester & Branch Correctly.

INSTRUCTION TO THE CANDIDATE FOR FILLING PART-III

1. Use blue or black ball point pen for writing alphabets & numerals in [ ] boxes.
2. Carefully study the example before you start marking.
3. As shown in the example below, blacken thecircles completely.

Correct Method	Incorrect Method
① ● ③ ④	✓ ✗ ◉ ④

4. Make no Stray marks o n this sheet.

5. DO NOT WRITE OR MARK ON THE BAR CODE.

IN ORDER TO AVOD UFM (UNFAIR MEANS) :

1. The Roll No. and Answer Book no. found elsewhere or any other symbol found in the answer book will be treated as unfair means.
2. Any tempering of Bar Code and Booklet no shall be treated as Unfair Means.
3. Do Not bring the materials like slip of paper/mobile/digital diaries/ study material/ revision notes in examination hall. Possession of the mobiles/ digital diaries/electronic/digital/ watch and any other electronic gadget except memory less scientific calculator shall be considered as UFM case.
4. Do not keep or paste currency note in answer script it shall be consider as UFM.

अनुचित साधन से बचने हेतु :

1. उत्तर पुस्तिका के निर्धारित स्थान को छोड़कर अनुक्रमांक एवं उत्तरपुस्तिका का क्रमांक कहीं और न लिखें तथा कोई भी चिन्ह न बनायें क्योंकि यह अनुचित साधन प्रयोग की परिधि में आता है।
2. उत्तर पुस्तिका के बारकोड अथवा उत्तर पुस्तिका संख्या पर छेड़ छाड़ करने पर अनुचित साधन प्रयोग माना जायेगा।
3. परीक्षा कक्ष में निम्न वस्तुएं साथ न लायें, जैसे लिखे हुए कागज के टुकड़े, मोबाइल, डिजिटल डायरी, डिजिटल वॉच, कॉपी, पुस्तक यह सभी वस्तुएं जो अनुचित साधन के अन्तर्गत आती है। केवल संबंधित प्रश्नपत्र में ही मेमोरी लेस साइंटिफिक कैल्कुलेटर ले जाने की अनुमन्यता होगी।
4. उत्तर पुस्तिकाओं में करेंसी न रखें न ही उत्तर पुस्तिका में चिपकायें। ऐसा करना अनुचित साधन प्रयोग की परिधि में आता है।

परीक्षार्थियों के लिए निर्देश

1. प्रवेश पत्र एवं उत्तर पुस्तिका पर दिये गये निर्देशों को ध्यान से पढ़ें।
2. कवर पृष्ठ के दूसरी तरफ कुछ न लिखें।
3. उत्तर पुस्तिका के पृष्ठों पर दोनों तरफ लिखें।
4. प्रश्न पत्र पर अपने अनुक्रमांक के अतिरिक्त कुछ न लिखें।
5. प्रश्न पत्र कोड एवं प्रश्न पत्र ID सावधानी पूर्वक लिखें।
6. अपनी स्थिति स्पष्ट लिखें।
7. उत्तर पुस्तिका के पृष्ठों की संख्या देखें। अगर उत्तर पुस्तिका में पृष्ठ (1-24) से कम है या फटे हुए है, तो परीक्षा शुरू होने के पूर्व दूसरी उत्तर पुस्तिका ले लें।
8. प्रश्नपत्र को देख, यदि प्रश्नपत्र के विषय कोड, विषय का नाम तथा प्रश्न में कोई त्रुटि है तो उसको परीक्षा शुरू होने के 30 मिनट के अन्दर कक्ष निरीक्षक को तत्काल सूचित करें, उसके बाद विश्वविद्यालय द्वारा कोई संशोधन नहीं की जायेगी।
9. प्रश्नों के उत्तर लिखने के लिये पेंसिल का प्रयोग न करें।
10. बी कॉपी या अतिरिक्त ग्राफ नहीं दिया जायेगा।

INSTRUCTION TO THE CANDIDATE

1. Read the instructions carefully given on the Question Paper, Admit Card & Answer Script.
2. Do not write anything on back side of the cover page.
3. Write on both sides of pages of answer book.
4. Do not write anything on question paper except Roll Number.
5. Write Paper Code & Question Paper Id carefully.
6. CHECK the number of pages (1-24) or any other kind of damage in your answer script, if found than change the answer script immediately before the commencement of examination.
7. CHECK the Question Paper for any kind of discrepancy e.g. Subject Code, Subject Name, and Question of the Question Paper during first THIRTY MINUTES of the commencement of the exam, so that it can be corrected in TIME. After that no corrections shall be entertained by the university.
8. Do not use pencil for answering the question.
9. Write status correctly e.g. those appearing in carry over papers should fill in status as Carry Over. Those appearing as Ex- Students should fill in status as ex.
10. No supplementary answer book & graph paper will be provided.

INSTRUCTION TO THE CANDIDATE FOR FILLING PART-IV

1. Use blue or black ball point pen for writing alphabets & numerals in [ ] Boxes.
2. Use blue or black ball point pen for filling the circles.

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1	●	1	●	1	1	1	1	●	1	1
2	2	2	2	2	2	2	●	2	2	2
3	3	3	3	3	3	●	3	3	3	3
4	4	4	4	4	●	4	4	4	4	4
5	5	5	5	●	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	●	6
7	7	7	7	7	7	7	7	7	7	7
8	8	●	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9	●

Note- If your Roll No. is of 10 digits. Please leave first three columns .

Paper Code
A G 3 0 0 8

1

Section-A

Ans-1

-: Ans-1 (a) :-

Apomixis :-

Apomixis is a word derived from Greek word Apo means away from and mixis means act of mixing. The term apomixis was coined by Winkler.

Definition :-

The development of embryo without fertilization is known as apomixis.

Types of Apomixis :-

i- Parthenogenesis
ii- Apospory
iii- Apogamy
iv- Diplospory
v- Adventive embryone
vi- Anamgamy
vii- Semigamy

Mainly 2 types of Apomixis :-

1- **Recurrent Apomixis :-**

When the embryo develope from the haploid cell. it's

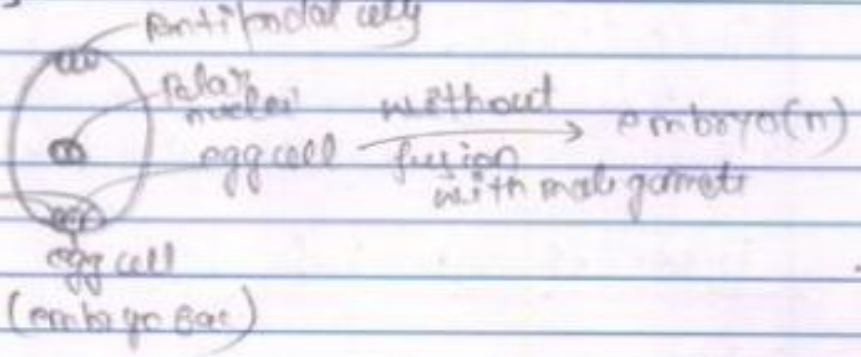
Paper Code

transfer the genes of apomixis character in offspring, transfer generation after generation is called recurrent apomixis. eg-

Diplospory.

2. Non-Recurrent Apomixis :-

When the embryo developed from haploid cells (n), it not transfer to generation after generation is called non-recurrent apomixis.



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Paper Code

3

Ans-1(B) :-

Back Cross :-

Back cross is crossing process in which F_1 offspring / progeny is crossed either of the 2 parents (recessive or dominant).

Procedure :-

(long) Suppose a parent whose genome is AA serve as dominant over the another parent whose genome is aa, (dwarf) is crossed in pea.

♂ ♀

(long) AA × Aa (Dwarf)

$F_1 \rightarrow$ Aa (long)

⇒ F_1 is crossed with dominant parent :-

Aa × AA (long)

$F_2 \rightarrow$ A : AA

1 : 1

(Aa = Heterozygous
AA = Homozygous)

⇒ When F_1 is crossed with recessive parent are called Test cross.

Importance of Back cross :-

Back cross procedure used in the breeding programme to transfer the resistant or favourable

Paper Code

gene in high yielding variety. This is developed thro programme called back cross method of plant breeding.

- This method used in cross pollinated crops.

∴ Ans-1(c) :-

Heterosis :-

The term heterosis was coined by Shull in 1914.

Heterosis may be defined as the superiority of F_1 over both of its parents used in cross in the characters like as -

general vigour, growth, yield etc.

Manifestation of Heterosis :-

i. Increase in plant growth in F_1 hybrids.
ii. Improvement in yield (eg- cotton, jute)
iii. Improvement in quality (Rice, pulse)
iv. Early maturation

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v. Increase in general vigor.

Inbreeding depression :-

Inbreeding depression may be defined as the reduction in fitness and vigour in progenies generation after generation.

Selfing leads to the high degree of inbreeding depression.

- Inbreeding depression is measured by inbreeding coefficient.

Inbreeding depression may be very high to nill.

- Severe inbreeding depression
- Moderate inbreeding depression
- Low inbreeding depression
- No inbreeding depression.

⇒ Inbreeding depression 1st observed by Darwin, concluded a statement in his book "Effects of self fertilization in Vegetable Kingdom" that the progeny obtained from (selfing) in maize is weaker generation after generation.

⇒ East (1908) & Shull (1909), precise study conduct by them.

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:- Ans-7(c) :-

Pureline Selection :-

It is a selection procedure used in self pollinated crops. In this selection individual plant progenies are selected & raise next generation, so it is also called Individual plant selection.

Procedure :-

Year

I — (i) a large no. of plants selected on the basis of phenotypic character
(ii) all the plant selected harvested seperately

II — (i) Individual plant progenies are grown in rows.
(iii) Superior plants selected & inferior discarded, & harvested seperately

III — (i) Plant progeny rows are grown in preliminary yield trial with standard check.
ii - Superior selected.

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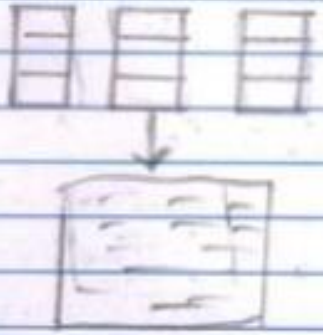
IV-VI



(i) Multilocation yield trials are done.
(ii) Best release of variety
→ Seed multiplication for distribution

Ans-1 (E) :-

Biotic Stress :-

Biotic stress may be difined as any abnormal bioorganisms that interfere the normal plant growth it called biotic stress. eg - Disease, insect etc.

Abiotic Stress :-

Any abnormal condition in the environment that interfere the natural growth of plant, organism is called abiotic stress. eg - temperature, humidity, rainfall, nutrient management, rain ect.

eg.
Khaira disease of Rice caused by - Zn deficiency.

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Ans-1(F):-

Wide Hybridization :-

The hybridization process in which the individuals are crossed either different species of same genera or different genus is called **wide** hybridization.

- **Interspecific Hybridization :-**

The mating between the individuals of different species of same genera.

eg -

- Oryza Sativa × Oryza elliptica

- **Intergeneric Hybridization :-**

The mating between the individuals of different species of different genera.

eg.

Triticum aestivum × Secale cereal
(wheat) (Rye)

Importance :-

i- To transfer some genetic traits from wild species. Is not present in cultivar

ii- Increase in yield, plant growth, early maturity.

iii- To developed / transfer the resistant

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against biotic and abiotic stresses.

Section - B

:- Ans-4 :-

Self - Incompatibility :-

Self -Incompatibility may be difined as the inability of with the functional male and female gemete to fertilize the same flower or different flowers of same plant.

OR

Inability of fertile pollen to fertilize the same flower or another flower of same plant.

Importance of Self Incompatibility :-

(i) Self incompatility leads to the cross pollination / allogamy & prevent the self pollination / autogamy.

Paper Code

ii. Self-incompatibility leads to the normal seed setting on cross pollination.

iii. Self incompatibility is mechanism of outbreeding.

iv. Self incompatibility leads to the increase in heterozygosity due to allogamy.

v. S.I. is a physiological, genetical mechanism not under simple control.

vi. S.I. can happen any stage of fertilization.

Mechanism of Self Incompatibility :-

i. The pollen will reaches to the stigma but will not germinate

ii. If pollen will germinate, it will not reach sufficient length of pollen tube to reach ovary.

iii. If pollen tube has sufficient length, it will not penetrate in ovary (inability).

iv. If gamete will reach in the ovule it will not emit with egg cell.

S.I. can happened any stage of fertilization.

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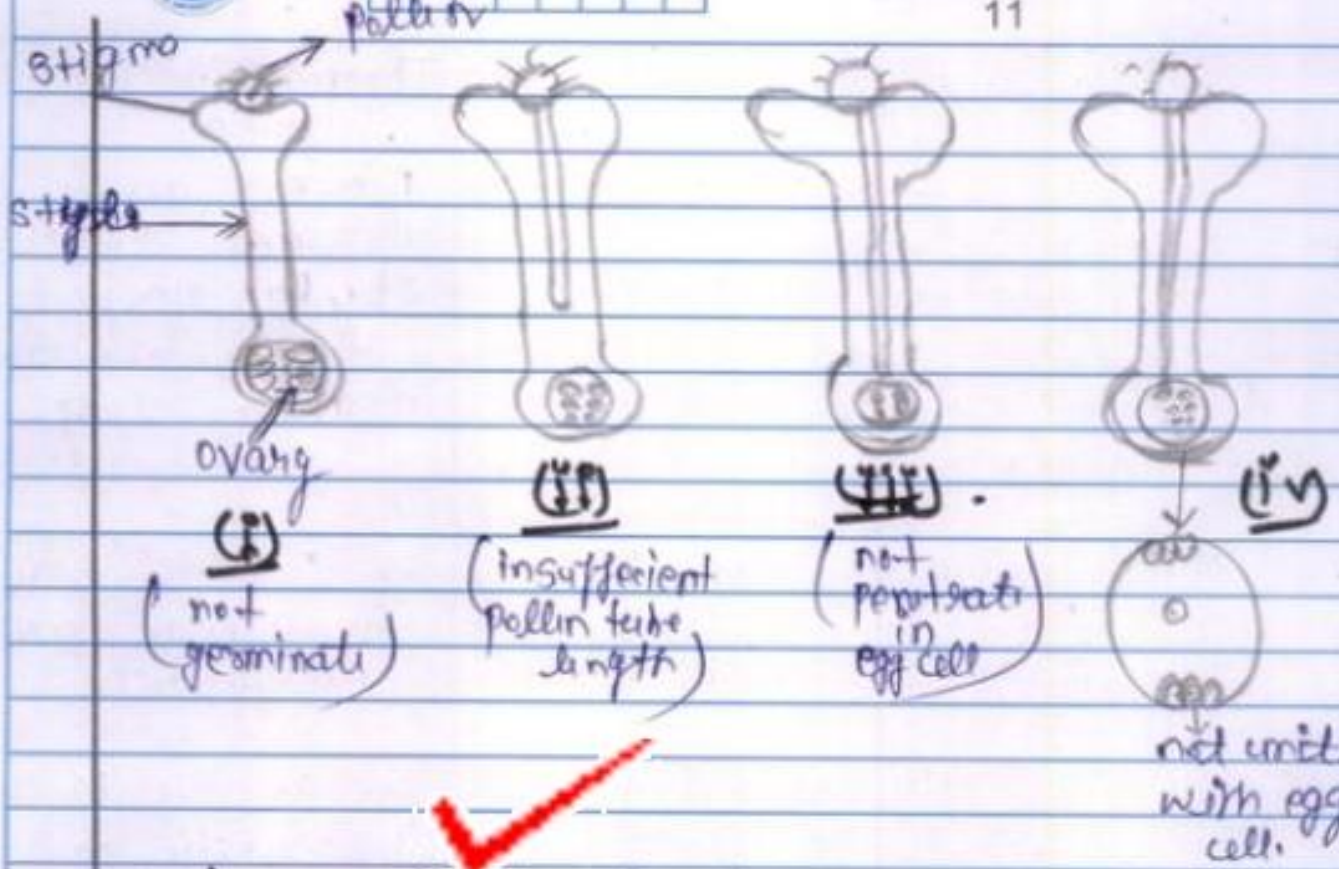

Types of S.I. :-

Self Incompatibility may be (defined) classified on the basis of :-

(i) Flower morphology.
(ii) Genetically / Genes involved.
(iii) Site of expression of pollen.
(iv) Pollen cytology.

Class	Self Incompatibility	Character
Flower morphology	(i)- Heteromorphic ii- Distyly	Flower has 2 type of length of style & stigma • pin flower (long style)

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- Thrum flower (long stamen)

a- Trimorphy → flower has 3 different length of style respect to stamen. i.e. short, medium, long.

(ii) Heteromorphic

a. Gametophytic → S.I. is governed by gametic constituent of gamete.

b- Sporophytic → S.I. is governed by genetic makeup of pollen producing plant.

Genes involved

(i) Monoallelic — when S.I. is governed by single allele

(ii) Diallelic — When S.I. is governed by double allele.

(iii) Polyallelic — when S.I. is governed by many alleles

Site of expression

(i) Stylar → The pollen tube may not sufficient length.

(ii) Stigmatic → pollen will not germinate

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	(iii) Dehiscence →	male gamete not unite with egg cell.
Pollen cytology	(i) Binucleate Stage	Pollen has 2 nuclei (generative + vegetative nucleus)
	(ii) Trinucleate Stage	Pollen has 3 nuclei (generative cell divide → 2 sperm cells + 1 vegetative nuclei)

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Section - C

Ans - 8

Mutation :-

The sudden changes in the genotype of an organism that must be heritable is called mutation or may be natural or induced by some mutagenic agent.

Types of Mutation :-

i- Spontaneous Mutation :-

The mutation that occurs naturally & that speed of mutation is very low, 10^{-6} or 1 in ten lakh, is called natural or spontaneous mutation.

eg- In Banana, grapes, Brassicae Triangle

- The rate of spontaneous may varies from different species. eg- R- gene in maize mutate 10^{-4} rate.

(ii) Induced Mutation :-

The mutation

that is done by interfering in plants by men & use to mutagenic agent to product mutation is called induced mutation. eg -

Pusa lerma variety of wheat is the mutation of lerma 64.

Types of Induced Mutation :-

(i) Macro Mutation
(ii) Micro Mutation.

Induction & Dose of Mutation :-

Mutation dose should consider that it would be LD50 (that kill the 50 % popn. of test animal).

It varies from / with different species of plant.

Induction :-

Some mutagenic agent is used to induction of mutation :-

(i) IRRadiation :- a - Ionizing IRRadiation :-
a Particulate IRRadiation :- α - rays, β - ray fast neutron, thermal neutron.

b Non - particulate IRRadiation :- x - rays
γ - rays.

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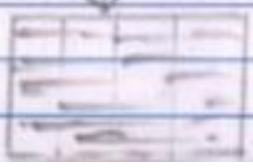
Nonionizing :- Ultra violet rays.

Chemical Agent :-

- N-Mustard, Sulpur Mustard, 5-Bromouracil, 5-Chlorouracil, Ethidium bromide, different types of acid.

⇒ In crop improvement we used mutation to mutate variety like Pusa Jorma which give more yield than original variety.

:- Procedure of Mutation in plant breeding :-

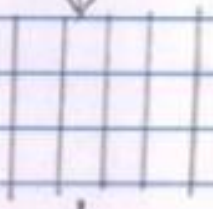
Year	Generation		
I	M_1		(i) Treated seeds are planted with space to produce maximum seed (ii) ~~The plant with mutation after harvested~~ (iii) All the plants are harvested with or without mutation seperately.
II	M_2		(i) The plants seed from m_1 generation

to grow in bulk.

(iii) The plant that are suspected to mutation are harvested.

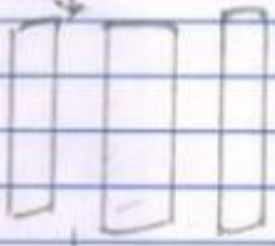
⇒ if they are homogenous/ phenotypically similar harvest in bulk.

⇒ If they are heterogenous Separate harvest

III M_3 

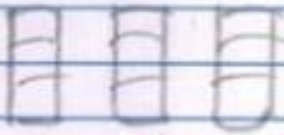
(i) Individual plant progenies were are grown

(ii) Best mutated plant are selected

IV M_4 

(i) Individual plant progenies were are grow with Standard check in PYT

(ii) Best plant selected.

V-VI M_5 

(i) Multilocation Yield trial

Seed multiplication

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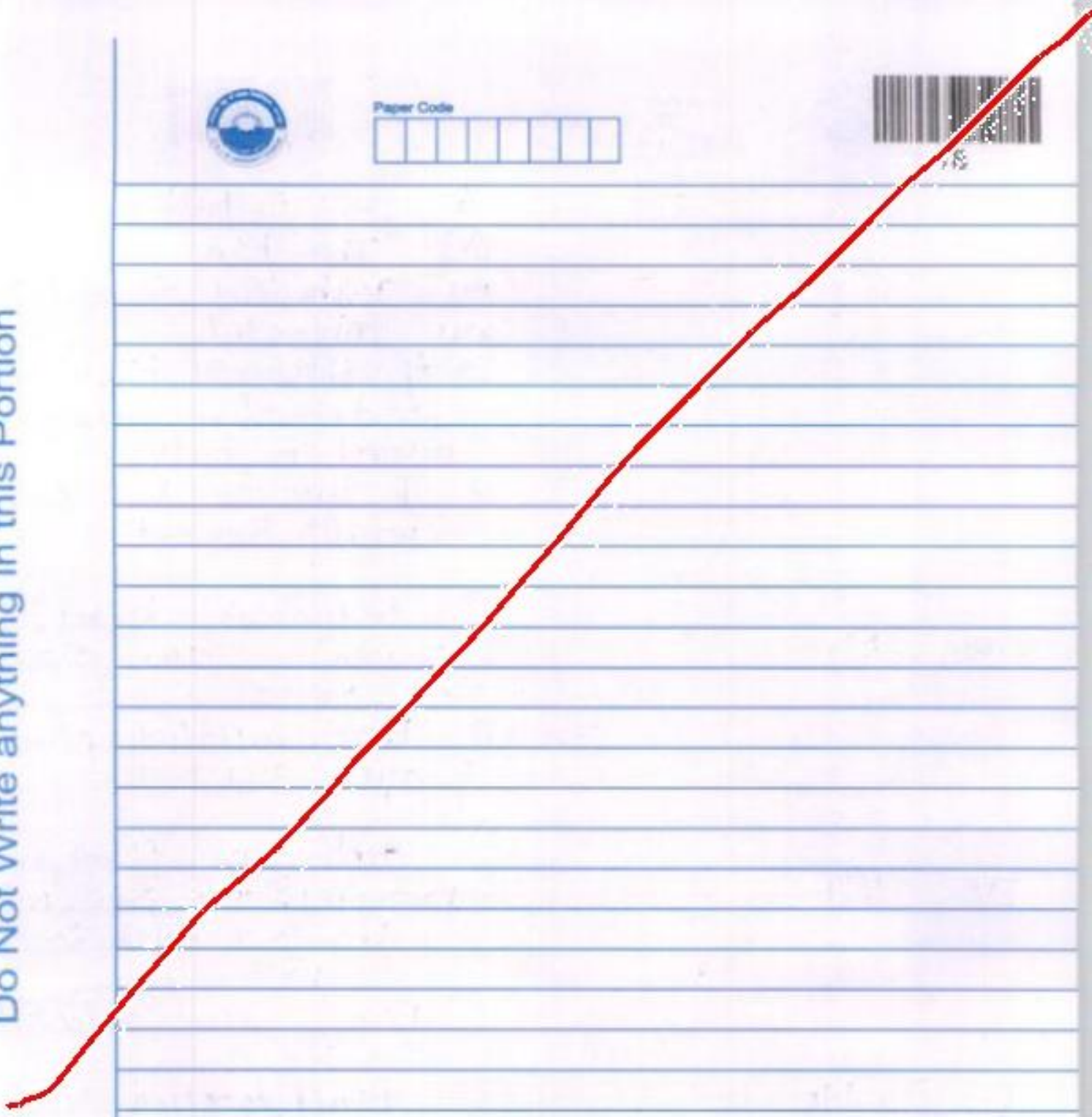

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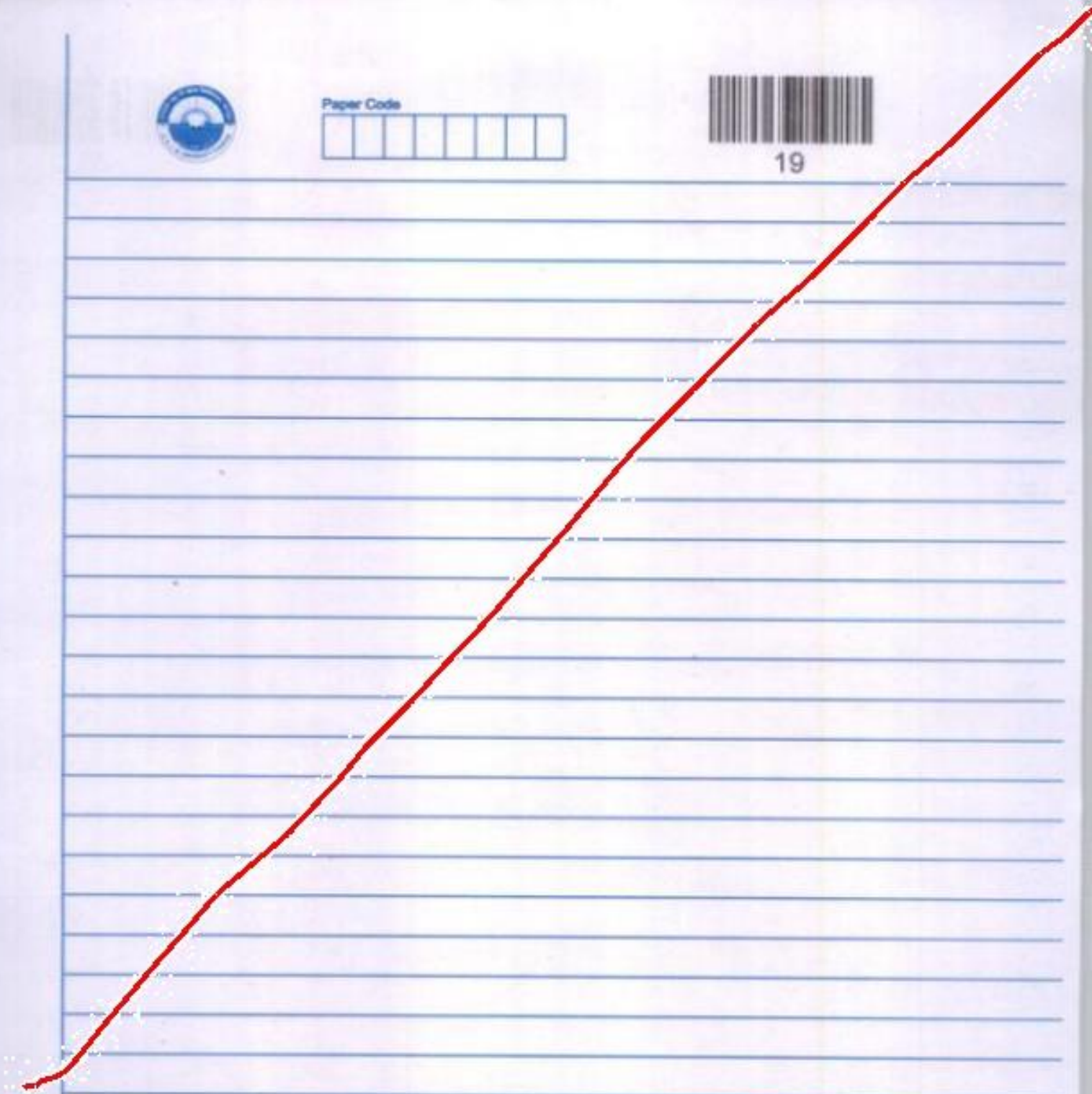

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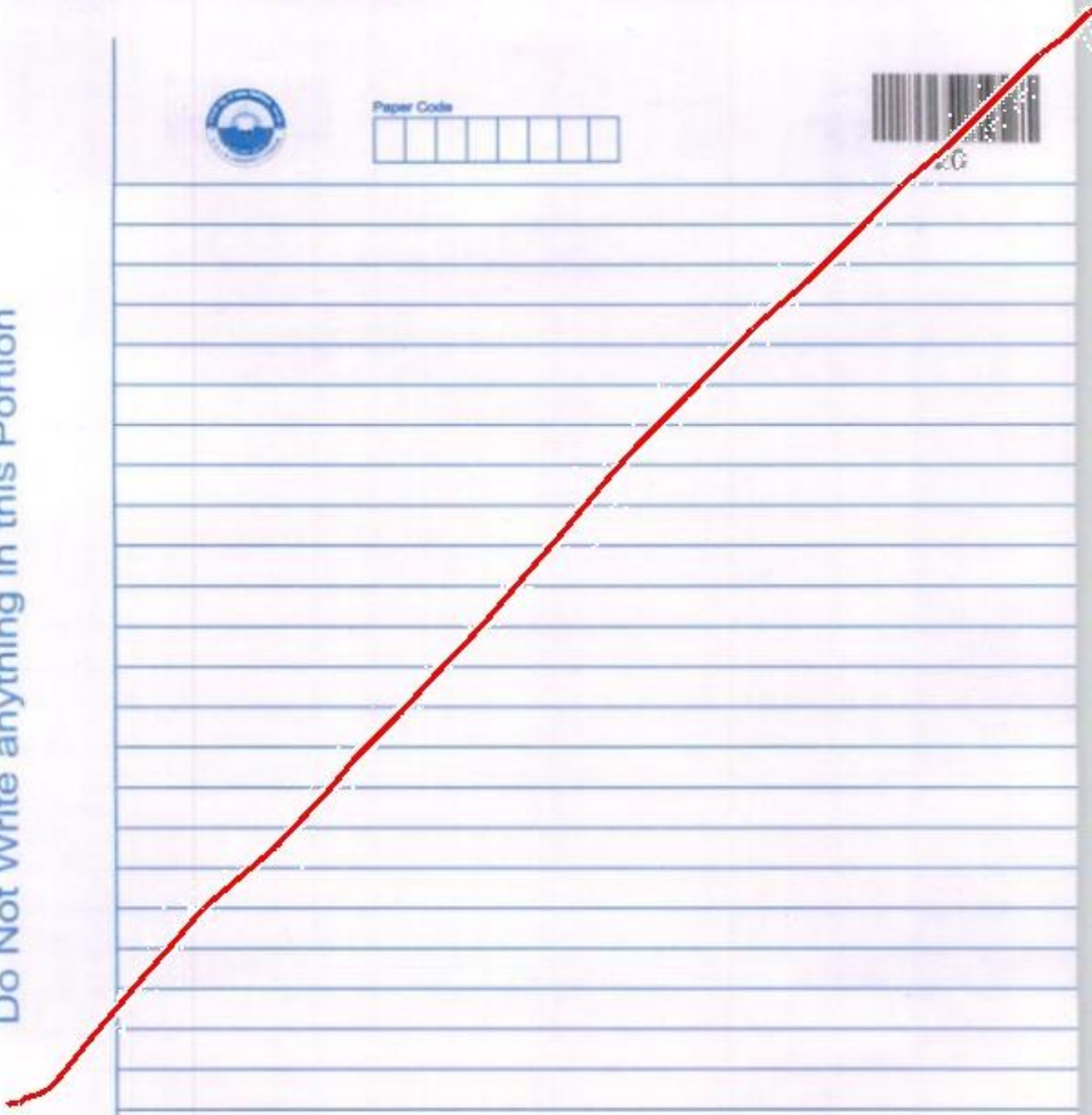

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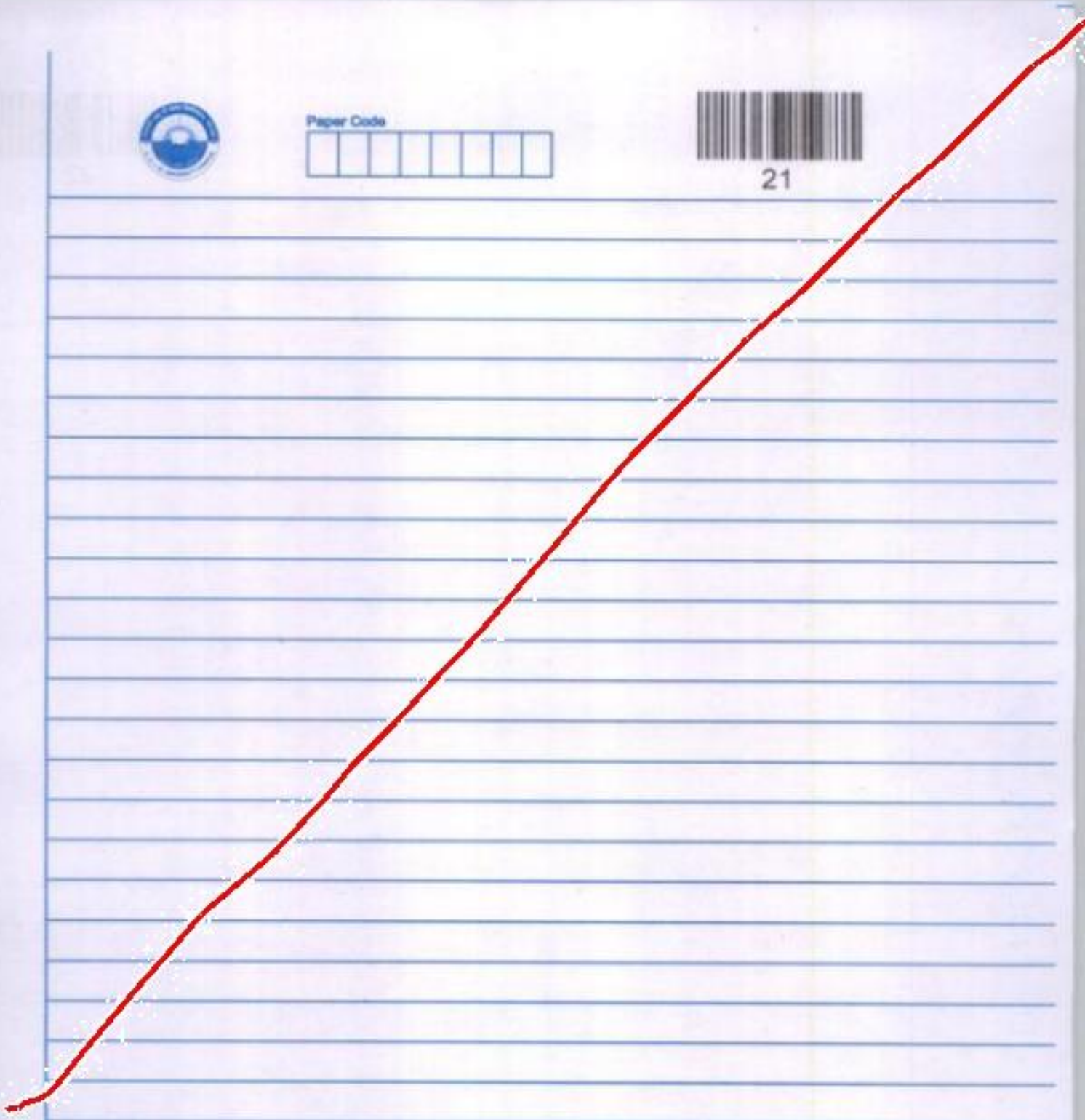

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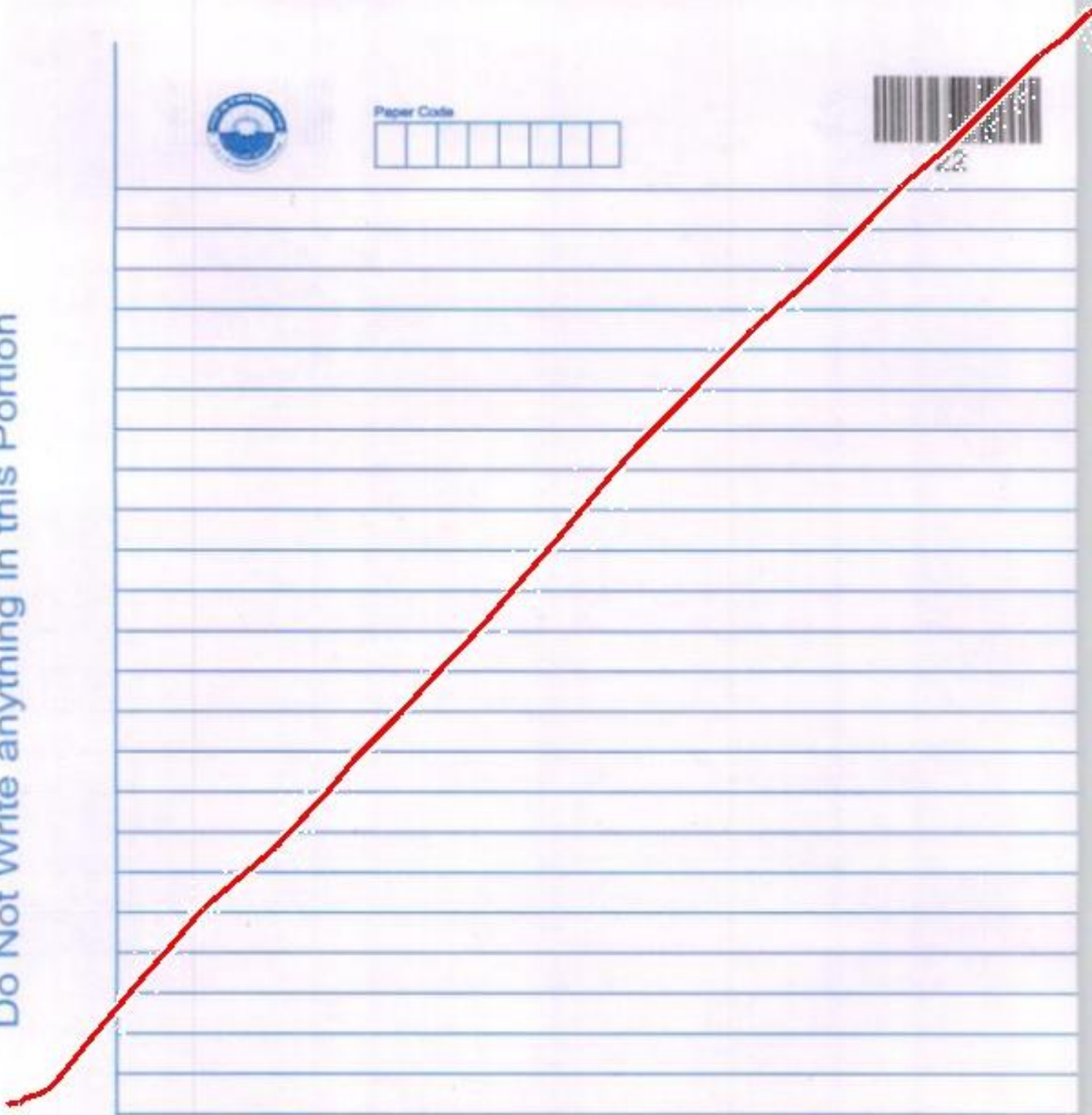

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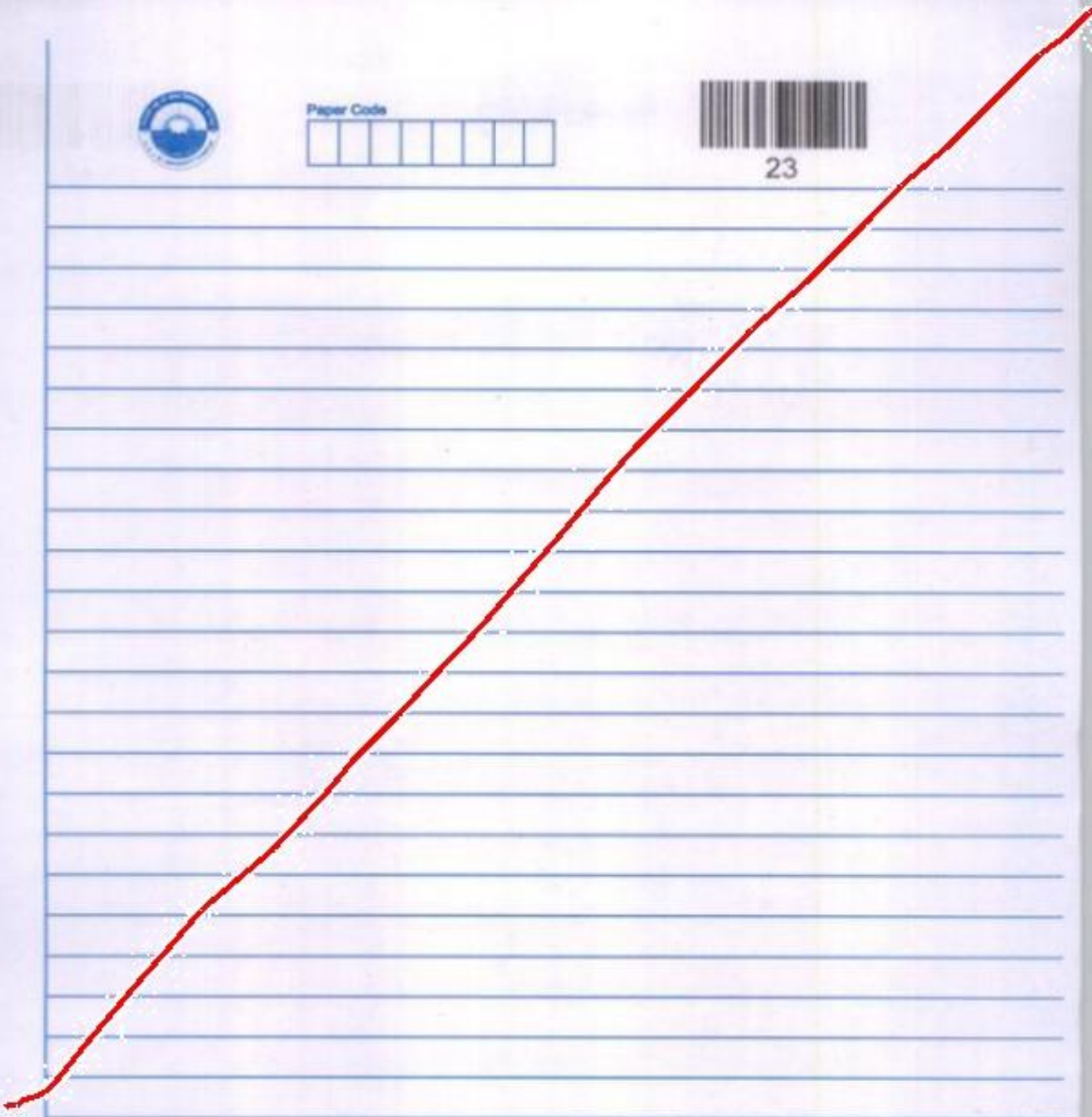

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BCCA(R)(I) Cew