Chhatrapati Shahu Ji Maharaj
University, Kanpur

Answer Script Details
Barcode 11346304

Roll No. 24079000007
Total Mark 55/75.00

Exam M.SC-III_ODD_EXAM_NOV_2025
Subject B060901T - Econometrics

Question wise Mark Summary

Q.No	Mark	Q.No	Mark	Q.No	Mark	Q.No	Mark
1A	4/5						
1B	4/5						
1C	3.5/5						
1D	3.5/5						
1E	3/5						
1F	3/5						
1G	3/5						
1H	3/5						
1I	4/5						
2	0/15						
3	0/15						
4	12/15						
5	0/15						
6	0/15						
7	12/15						
8	0/15						
9	0/15						

Chhatrapati Shahu Ji Maharaj University
Kanpur, Uttar Pradesh

PART-I

Date of Exam: 4/2/25 Shift: 3 Room No.: 9

Paper Code: B060301 Subject: Statistics Year/Sem: 3

Name of Candidate: Divya Dwivedi

Roll No: 2407900007

Signature of Candidate: Divya

Signature of Invigilator:

COE Facsimile

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										

B060901T

Paper Code

Signature of Evaluator

PART-III

Course: MSC

Session: 2025-26 Year/Semester: 3

Subject: Statistics (Econometrics)

Paper Code: B060901T

Exam Date: 02/12/2025

Name of Candidate: DIVYA DWIVEDI

Father's Name: SANTRAM DWIVEDI

College Code: KN03

Exam Centre Code: KN03

Type of Exam: Regular ● Ex. Student ○ Private ○ Back paper Exam ○

ANSWER BOOKLET NO.: 11346304

B060901T

Paper Code

PART-IV

Enrollment Number: CSJMA240000003621

Candidate's Roll Number: 2407900007

Paper Code: B060901T

Signature of Candidate: Divya

Signature of Invigilator:

C S Facsimile

COE Facsimile

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

INSTRUCTIONS 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.

INSTRUCTIONS 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 the circles completely.

Correct method	Incorrect method
① ● ③ ④	✓ ✗ ◉ ⊙

4. Make no Stray marks on this sheet.
5. **DO NOT WRITE OR MARK ON THE BAR CODE.**

परीक्षार्थी 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 कोड 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 उत्त पुस्तिका ले लें।
8. प्रश्नपत्र को देख, यदि प्रश्नपत्र के विषय कोड, विषय का नाम तथा प्रश्न में कोई त्रुटि है तो उसके परीक्षा शुरू होने के 30 मिनट के अन्दर कक्ष निरीक्षक को तत्काल सूचित करें, उसके बाद विश्वविद्यालय द्वारा कोई कार्यवाही नहीं की जायेगी।
9. प्रश्नों के उत्तर लिखने के लिये पैंसिल का प्रयोग न करें।
10. B कोपी या अतिरिक्त ग्राफ नहीं दिया जायेगा।

IN ORDER TO AVOID 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 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.

INSTRUCTIONS TO THE CANDIDATE

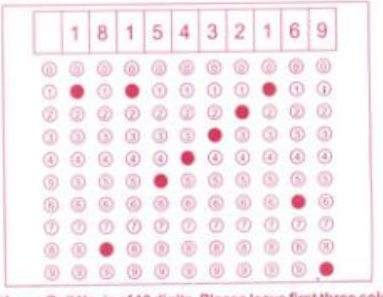
1. Read the instructions carefully given on the Question Paper Admit Card & Answer Script.
2. Do not write anything on back side of the cover page.
3. Write on both sides of pages of answer book.
4. Do not write anything on question paper except Roll Number.
5. Write Paper Code & Question Paper Id carefully.
6. CHECK the number of pages (1-32) or any other kind of damag in your answer script, if found than change the answer scrip 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 Questio Paper during first THIRTY MINUTES of the commencement the exam, so that it can be corrected in TIME. After that n 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 paper should fill in status as Carry Over. Those appearing as E Students should fill in status as ex.
10. No supplementary answer book & graph paper will be provided.

अनुचित साधन से बचने हेतु:

1. उत्तर पुस्तिका के निर्देशित 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 करने पर अनुचित साधन प्रयोग माना जायेगा।
3. परीक्षा कक्ष में निम्न वस्तुएं साथ न लायें, जैसे लिखे हुए कागज के टुकड़े, मोबाईल, डिजिटल डायरी, कोपी, पुस्तक या सभी वस्तुएं जो अनुचित साधन के अन्तर्गत आती है। केवल सत्यापित प्रश्नपत्र में ही सेमेरी लेस साइटफिक कैल्कुलेटर ले जाने की अनुमन्यता होगी।
4. उत्तर पुस्तिकाओं में रूपये न रखें न ही उत्तर पुस्तिका में चिपकायें। ऐसा करना अनुचित साधन प्रयोग की परिधि में आता है।

INSTRUCTIONS TO THE CANDIDATE FOR FILLING PART-IV

1. Use blue or black ball point pen for writing alphabets & numberals in ☐ Boxes.
2. Use blue or black ball point pen for filling the circles.



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

Paper Code: B 0 6 0 9 0 1 T

01

Short Answer Type Questions

1(A) Assumptions of Classical linear Regression Model —

On the basis of assumptions of CLRM we can check the validity of OLS (Ordinary least square)

The following assumptions are —

- Linearity — The model should be linear in parameter.
- Random sampling — Data should be collected through random sampling.
- No multicollinearity — There should be no multicollinearity means two Independent variables are not correlated with each other.
- No autocorrelation — The error terms are not correlated, the correlation between error term called

autocorrelation which is not required.

- Homoscedasticity — The Variance of the error term should be constant
- No Zero mean error — $E(u/x) = 0$
- Normality — The model should be normally distributed.

Under these assumption OLS become BLUE - Best linear Unbiased estimator.

(B) General linear Model — In regression coefficient two one variable are dependent on another value of dependent variable is affected by the Independent Variable.

GLM model can be written as —

$$Y = X\beta + u$$

GLM provide the framework in which OLS is used to estimate the parameter

Ordinary least square — OLS is used to estimate regression coefficient in where GLM provide framework.

OLS chooses β's so that the sum of square of observed or predicted value of Y is minimum

OLS can be written as —

$$\hat{\beta} = (X'X)^{-1}X'Y$$

OLS estimate regression coefficient by providing unbiasedness and minimum variance.

The key difference is GLM provide the model in which OLS applied to get minimum variance and unbiased estimator

(C) The primary consequences of ignoring heteroscedasticity when using OLS—

- Heteroscedasticity means the Variance of the error term is not Constant.
- By Ignoring hetersocedasticity — OLS requires Variance of the error term constant which is homoscedasticity if not then OLS become ~~unbiased~~ Biased.
- If heteroscedasticity is present than OLS does not give efficient result and model cannot be stable.
- Hetersocedasitfigity violates one of the main assumption of Classical linear Regression Model (CLRM) i.e. homoscedasticity.

(D) Intrinsically non linear —

Intrinsically non linear are the models than can not be converted into linear parameter.

$$Y = \frac{1}{1 - e^{-(a+bx)}}$$

This can not be transformed into linear parameter :-

(E) Orthogonal polynomial Regression —

polynomial regression Introduce multicollinearity so that the power of x are correlated.

To avoid this, Orthogonal Polynomials Introduce.

Othbogonial Pollynomial are —

$$\sum p(x_i)\, p(x_j) = 0 \qquad i \neq j$$

Advantage of orthogonal polynomial is to estimate curved fitted regression, reduce correlation and decrease multicollinearity of the model.

~~(G)~~

(F) Prediction interval in the context of a regression Model—

In a regression Model— ~~$Y = X\beta + u$ —i)~~

$Y = \alpha + X\beta + U$ —(i)

$Y_i = \alpha + X\beta_i + u_i$ —(ii)

Prediction is used to estimate the value of predicted Y with the help of Independent Variable X.

Predicted values are also called fitted values. which is obtain through estimate X. On solving eq(i) from this we get eq(ii) as a predicted value of Y

OLS the prediction value is similar as GLS but the GLS corrects for autocorrelation and heteroscedasticity.

(G1)

Two stage least square (2SLS)

Two stage least square estimator is introduced by Henry and Robert Bassman.

The primary purpose of Two stage least square is to remove biasness in simultaneous linear equation model.

Two stage least square are applied on the equation which is over indentified.

It use OLS twice in the equation 2SLS is used to obtain instrumental variables through explanatory variable.

In small sample 2SLS is bias, error

and in large sample, 2SLS removes biasness to zero error and gives stable model.

Two stage least square gives efficient coefficient.

(H) Rank Condition for Identification of an Equation in a system —

In simultaneous linear equation it requires Identification as a check. So there are underIdentification — In this there is no estimator. and in Exact Identification — SLS (Indirect least square is used as estimator)

For Over Identification — there are methods like: 2SL; LML and FIML used.

The Rank condition for Identification depends on the Outer correlation Matrix. through the Exogenous Variable.

(I) Indirect least square —

Indirect least square is used when simultaneous linear equation is just or exact Indentified. It is used to obtain structure coefficient estimator from OLS to reduced coefficient.

Properties of Indired least square —

It is only used when equation is exactly Indentified.
It Provide consistent parameter.
It is easy to use.

disadvantages —

- Inconclusive large area
- Only used in Exactly Identified equation
- Indirect least square is performed through
- Transforming the model from reduced coefficient to structural coefficient.
- The method is used in the equation of SLE (Simultaneous linear equation)

LONG ANSWER

4. **Multicollinearity** – In multicollinearity two or more independent variables are highly correlated.

$$Y = a + bX + u$$

There are two types of multicollinearity –

- **Perfect multicollinearity** – In perfect multicollineary the model gives linear parameter.
- **Non perfect multicollinearity** – In the model becomes unstable.

In multicollinearity –

OLS Becomes unbiased

OLS gives unstable results
Standard error become very large
coefficient become unstable .
Small change in data big change in estimates.

Model loses its prediction power.

It can be handled by -

- High correlation Matrix
- High R^2 low t statistic
- VIF Variance Inflation factor (VIF)

$$VIF = \frac{1}{1 - R^2}$$

techniques for handling its effect -:

- On dropping the correlated variable
- Composite Variable - form and index and reduce correlation.

Ridge Regression—

In Regression analysis when the ~~error~~ terms Independent Variables are correlated it create multicollinearity. to remove this effect Ridge Regression is used

$$\hat{\beta}_{Ridge} = (X'X + KI)X'Y$$

If introduced Constant KI which helps to reduce the effect of multicollinearity.

$K > 0$

I = Identity matrix.

Section C

(7)

SEM – Simultaneous linear Equation Model.

Simultaneous linear equation is a system in which two or more independent Variable are determined together.

If one is affected through second simultaneously second one is also affected by the first.

$$Q_d = a_1 + P.t + u_1$$
$$P. = a_2 + Q.t + u_2$$

It shows the depedency of the variables in the equation.

If price effect quantity demanded similary quantity demanded effect price.

Identification in SEM is a check that how to estimate parameters

Identification is—

- Under identified — It cannot be estimated
- Exactly identified — It can estimated by using ILS
- Over identified — It can be identified by using methods like—

→ 2SLS — 2 stage least square

→ LIML — Limited information maximum likelihood.

→ FIML — full information maximum likelihood.

For exactly Identified →

ILS — Indirect least square —

Indirect least square is used to obtain exactly / just identified eqn.

It is formed by obtaining structured coefficient OLS estimates of reduced coefficient.

To apply it first transform the model from reduced coefficient to structure coefficient. by using OLS and then apply ILS

For Over Identified —

two stage least square —

Two stage least square is used to remove biasedness in simultaneous linear equation.

- In small sample error 2SLS becomes Bias
- In large sample error 2SLS

gives zero biasedness.

Limited information maximum likelihood

- This is similar to two stage least square.
- LIML gives biasedness in
- small sample.
- In large sample LIML becomes efficient and stable.
- These models are easy to compute.

Paper Code

Paper Code

Do Not Write anything in this Portion

X

Paper Code

Do Not Write anything in this Portion

Paper Code

X

Paper Code

21

X

Paper Code

Do Not Write anything in this Portion

Paper Code

$Y_i = \beta_0 + X\beta_i + u$

$Y_i = \alpha + X\beta_i + u$

$Y = aX + b$

$Y = a\ bX +$

$Y = aX + u$

$Y = aXb + u$

$Y = aX + b + u$

$Y = a + bX + u$

$Q_s = a + Pd + u_t$

$P_s = a$

X