INDIAN STATISTICAL INSTITUTE
B.STAT-II (1999-2000)
Theory of Probability and its Applications - III
Semestral-I Examination
Maximum marks: 100. Time: 3 hours.

Date : 8 Nov,1999.

Note: Answer as many questions as you wish.
The whole question paper carries 110 marks.
The maximum you can score is 100.

1. $X_1, X_2, \cdots,$ are *iid* random variables with exponential $\mathcal{E}(\alpha)$ – distribution ($\alpha > 0$).
Let $S_0 = 0$ and $S_n = \sum_1^n X_i$, $n \geq 1$. Let $t > 0$ be a fixed real number. Let us define a positive integer-valued random variable as follows :
$$N = k \text{ if and only if } S_{k-1} < t \leq S_k\,,\ k = 1, 2, \cdots .$$
(a) Find $P(N = k\,,\ X_k \leq a)$, for $k = 1, 2, \cdots$ and $a > 0$.
(b) Show that the random variable X_N has the density :
$$f(x) = \begin{cases} \alpha^2 x e^{-\alpha x} & \text{for } 0 < x \leq t \\ \alpha(1+\alpha t)e^{-\alpha x} & \text{for } \quad x > t. \end{cases}$$
[[illegible]+6]

2. Let $(X_1, X_2, \cdots, X_r)$ follow r – variate Normal with $E(X_i) = \mu\,, Var(X_i) = \sigma^2$ and $Cov(X_i, X_j) = \rho\,\sigma^2$, $i \neq j$, $i, j = 1, 2, \cdots, r$, where $-\frac{1}{r-1} < \rho < 1$.
Let $\bar{X} = \frac{1}{r}\sum_1^r X_i$, $S^2 = \sum_1^r (X_i - \bar{X})^2$.
(a) Show that $\bar{X}$ follows $N(\mu\,, \frac{[1+(r-1)\rho]}{r}\sigma^2)$.
(b) Show that $\frac{S^2}{(1-\rho)\sigma^2}$ follows χ^2_{r-1}.
(c) Show that $\bar{X}$ and S^2 are independent.
[15]

3. (a) Define convergence in probability . Show that if X_n converges in probability to 0 then there is a subsequence $\{X_{n_k}\}$ of $\{X_n\}$ such that X_{n_k} converges to 0 $a.s.$
(b) Define convergence in distribution . Show that (X_n, Y_n) are random variables defined on the same sample space for $n = 1, 2, \cdots$, such that $X_n \xrightarrow{\mathcal{L}} X$ and $Y_n \xrightarrow{P} a$ then $X_n Y_n \xrightarrow{\mathcal{L}} aX$.
[(2+13)+(3+7)]

(Please turn overleaf)

4. Let $X_1, \ldots, X_n$ be a sample from a population with density $P(x,\theta)$ given by

$$P(x,\theta) = \begin{cases} \frac{1}{\sigma} e^{-\left[\frac{x-\mu}{\sigma}\right]} & \text{if } x \geq \mu \\ 0 & \text{otherwise.} \end{cases}$$

Here, $\theta = (\mu, \sigma)$ with $-\infty<\mu<\infty$ and $\sigma>0$.

(a) Obtain a two dimensional sufficient statistic for this mod

(b) Obtain two sets of estimators of θ, using MLE and method o moments respectively. [5+10+10

5.(a) Describe Neyman-Pearson formulation of a statistical hypoth testing problem as a constrained optimization problem.

(b) State and prove Neyman Pearson Lemma.

(c) Suppose $X_1, \ldots, X_n$ are iid $N(\theta, \sigma^2)$. Work out the most powerf test for H_0: $\theta = 0$, $\sigma^2=1$ vs. H_1: $\theta=1$, $\sigma^2=2$ of size $\alpha=0.05$ explicitly. [5+10+10

INDIAN STATISTICAL INSTITUTE

B.Stat.(Hons) IInd Yr.(1999-2000)

Semestral-I Examination

Calculus III

Date:15.11.1999 Full Marks :100 Time:$3\frac{1}{2}$ hours

Note: There are 6 questions carrying 110 marks.Maximum one can score is 100.Marks allocated to each question are shown in [ ].

1.(i) Let (X,d) be a metric space. Suppose

$e\{(x,y),(x',y')\} = d(x,x') + d(y,y')$ *where* $(x,y),(x',y') \in X \times X$ be the product metric on $X \times X$. Show that the metric d is a real-valued uniformly continuous function on $X \times X$ in the product metric e.

(ii) Define a complete metric space.
Let (X,d) be a complete metric space and $U \subset X$ is a non-empty open subset.
Define $\delta : U \times U \to \Re$ as follows
$\delta(x,y) = d(x,y) + \mid \frac{1}{d(x,U^c)} - \frac{1}{d(y,U^c)} \mid$; $(x,y) \in U \times U$ where
$d(x,U^c) = inf\,\{d(x,y) : y \in U^c = X - U\}$.
Show that (a) δ is a metric on U,
(b) For any sequence $\{x_n\}$ in U and $x \in U$, $d(x_n,x) \to 0$ iff $\delta(x_n,x)$ tends to 0 as $n \to \infty$,
(c) (U,δ) is a complete metric space.

[5+(2+2+4+10)=23]

2 Let $f : \Re^n - \{0\} \to \Re$ be a continuous differentiable function whose partial derivatives are uniformly bounded, $\mid D_i f(x) \mid \leq M > 0$ for all $x = (x_1, x_2, .., x_n) \neq \mathbf{0}$, for $i = 1, 2, ..., n$.Show that,if $n \geq 2$, then f can be extended to a continuous function on all of $\Re^n$.Show by means of an example that the above statement is false for $n = 1$.

[12+3=15]

3(i) Let $g_1, g_2 : \Re^2 \to \Re$ be continuously differentiable and suppose $D_1 g_2 = D_2 g_1$.
Let $f : \Re^2 \to \Re$ be defined by

$$f(x,y) = \int_o^x g_1(t,0)dt + \int_o^y g_2(x,t)dt.$$

Show that $D_1 f(x,y) = g_1(x,y)$ and $D_2 f(x,y) = g_2(x,y)$.

(ii) Let $f : [0,1] \times [0,1] \to \Re$ be defined by

$$f(x,y) = 1 - \tfrac{1}{q} \text{ if } x \text{ is rational}=\tfrac{p}{q} \text{ in lowest terms and } y \text{ rational,}$$
$$= 1 \quad \text{otherwise.}$$

Show that f is integrable and $\int_{[0,1]\times[0,1]} f = 1$.

Group B

3. a) The production technology of a firm is given by the production function $f(x_1,x_2)=\min(2x_1+x_2, x_1+2x_2)$, where x_1 and x_2 are the amounts of two inputs whose unit prices are given and constant. Derive the conditional demand function for the first input.

b) Consider a firm which has cost function C=vq, where v is the constant average cost of production and q is the amount of the good produced. Now, production of one unit of output generates α units of pollution, $\alpha > 0$. The firm will have to pay a tax t>0 per unit of pollution created, subject to a maximum permissible pollution level Z, beyond which the tax rate goes to infinity. Assume that the firm's goods can be sold only in the international market, where the firm faces a constant product price, p. Formulate the problem and derive the supply curve of the firm.

[15 + 20=35]

4. a) Consider a monopoly market for a product with demand function $p = a - x$ and cost function $c = bx$, $a > b > 0$, where p and x are price and quantity of the product, respectively. The government asks the monopolist to accept either of the following tax schemes and pay tax accrodingly.

i) pay tax t per unit of outoput produced; or
ii) pay a lumpsum tax T indeependent of the output level.
It is, however, known that in either of the schemes the government collects the same amount of tax revenue. Will the monopolist be indifferent between these two schemes ? Explain.

b) Suppose that a monopolist has already committed to supply an output level q to a company. He has two plants to produce output, which correspond to two different cost functions C_1 and C_2. How will the firm allocate its production between the two plants ?

c) Consider an oligopoly market for a homogeneous product. There are exactly two firms in the industry. The cost function of

the ith firm is $C_i(q_i) = F_i + bq_i \;\; if q_i > 0$
$= 0$ otherwise

where F_i is the fixed cost, and b is the average variable cost. The market demand is $p = a - (q_1 + q_2)$, where p is the price of the product. Derive Cournot equilibrium output levels of the firms.

OR

Consider a competitive industry with negatively sloped market demand. All potential firms have access to the same production technology. Assume that they have U-shaped long run average cost curves. How do you derive each firm's long run equilibrium output, the industry output, the market price and the number of active firms in the long run ?

[11 + 9 + 15=35]

INDIAN STATISTICAL INSTITUTE

Second Semestral Examination : (1999-2000)
Course Name : B.Stat. (Hons) II & III
Subject Name : Biology II
Date :20.4.2000 Maximum Marks : 60 Duration : 3 hrs.

1. Classify rice crop with names of two cultivars in each group. Write in brief the different cultural practices for transplanted rainfed rice. 10

OR

2. Write down the mathematical model on two species intercropping system and show that the inhibitory effect on the row-intercropping system plays an important role in the dynamics of the system. 10

3. What are the essential plant nutrients? If the recommended dose of nutrient for rice are 80 kg N + 50 kg P_2O_5 + 50 kg K_2O, find the requirement of FYM, Urea, Single super phosphate and KCl. 50% of the recommended Nitrogen should be given through FYM. 3+7

4. Write short notes on (any four)
a. Monsoon onset
b. Moisture availability index
c. Micro nutrients
d. Water holding capacity of soil
e. Soil texture
f. Yield attributing characters of rice
g. Reproductive phase of rice 10

4. How does a plant chemically protect itself from pathogens? Explain why Onion variety with red scale leaf is resistant to Smudge disease? How dose silica layer on epidermis in resistant rice variety help to protect the blast disease of rice? 2+4+2

6. What are enzymes? Write the salient features of an enzyme. What is meant by a competitive inhibitor? Write a brief account of the factors affecting the enzyme activity? 2+2+2+4

OR

7. What are the requisite natures of a chemotheraputant? What are the modes of action of a chematheraputant? What are the systemic fungicides and what are the types of this? 2+3+5

8. Write short notes on:
a. Totipotency
b. Photoperiodism
c. Typtophan path way of IAA synthesis
d. Michalis – Menten Constant
e. Prosthetic group
f. Quinone 6x2

INDIAN STATISTICAL INSTITUTE

SECOND SEMESTRAL EXAMINATION (1999-2000)
B.STAT (Hons.) II Year
ELEMENTS OF ALGEBRAIC STRUCTURES

DATE OF EXAMINATION : 24 APRIL 2000

Maximum Marks : 100 | Duration: [illegible]

Answer all questions.

1. a) Let p be a prime and let G be a group of order p^2. Show that G is abelian.

   b) If G is a group order p^2q where p,q are distinct primes, show that G [illegible] normal subgroup.

2. a) G is a finite group and P is a p-sylow subgroup of G. Show that P is the [illegible] subgroup lying in the normaliser of P in G.

   b) Find the number of non isomorphic Abelian groups of order [illegible]. Give [illegible]

3. a) Let D be an integral domain and a, b be elements of D. Suppose that [illegible] two relatively prime positive integers m and n. Show that [illegible]

   b) Let F be a field of characteristic $p \neq 0$ and let K be an extension of F.

   Let $T = \{ a \in K \,/\, a^{p^n} \in F$ for some integer n $\}$

   Show that T is a sub field of K and that every automorphism of K [illegible] of F fixed, leaves every element of T also fixed.

4. Explain how to construct a field of p^n elements. Construct the field [illegible] and find [illegible] primitive element in this field.

5. Prove or disprove.

   a) If E, F are subgroups of a group G such that E is normal in F and F is normal in G, [illegible] is normal in G.

   b) Any automorphism of the field of real numbers fixes each element in it.

   c) If H is a subgroup of a finite group G such that it is the only subgroup of [illegible] H is normal in G.

INDIAN STATISTICAL INSTITUTE

Statistical Methods IV

B II, 2nd Semester

Semestral Examination

Total points 100

Date: 02.05.2000 Time: 3:00 hours

Clearly explain your assumptions and notations used so that all answers are self-contained and to the point.

1. Let X be a $N(0,1)$ random variable, and let I, independent of X, be such that $P[I=1]=\frac{1}{2}=P[I=0]$. Now define Y by

$$Y = \begin{cases} X & \text{if } I=1 \\ -X & \text{if } I=0 \end{cases}$$

(a) Are X and Y independent?

(b) Are I and Y independent?

(c) Show that Y is normal with mean 0 and variance 1.

(d) Show that $Cov(X,Y)=0$

(e) Do (a), (c) and (d) contradict the result that uncorrelated jointly distributed normal random variables are independent. [3+3+4+4+6=20]

2. If r is the sample correlation coefficient of a random sample of size n $(n>2)$ from a bivariate normal population with population correlation coefficient $\rho=0$, show that $r\sqrt{n-2}/\sqrt{1-r^2}$ has a t distribution with $n-2$ degrees of freedom. [12]

3. Suppose that a random sample of size 10 is available from a trivariate normal distribution, with mean vector $\mu=(\mu_1,\mu_2,\mu_3)'$, and covariance matrix $\Sigma_{3\times3}(>0)$. The sample mean vector and the sample covariance matrix (with denominator $n-1$) are, respectively

$$\bar{X}=(1.23, 1.96, 0.84), \quad \text{and} \quad S=\begin{pmatrix} 0.2994 & 0.1774 & 0.1278 \\ 0.1774 & 0.1075 & 0.0747 \\ 0.1278 & 0.0747 & 0.0693 \end{pmatrix}.$$

P.T.O

Using the Hotelling's T^2 statistic test the null hypothesis $H_0 : \mu_1 = \mu_2 = \mu_3$, against the alternative that all the μ_i's are not equal at level $\alpha = 0.05$. [14]

4. Let $(X_1, \ldots, X_n)$ be a random sample from the uniform distribution on $(0, \theta)$. Show that, for large n, $\sqrt{12} \log \left(2\bar{X}\right)$ is an approximate normal $\left(\sqrt{12} \log \theta, \frac{4}{n}\right)$ variable. [12]

5. The progeny of a certain mating were classified by a physical attribute into three groups, the numbers being 10, 53, and 46. According to a genetic model, the proportion of observations in these three groups should be $p^2, 2p(1-p), (1-p)^2$. Test whether the data are consistent with the model at level $\alpha = 0.05$. [12]

6. (a) Given the random variables $X_1, \ldots, X_p$ with associated dispersion matrix Σ define the partial correlation coefficient $\rho_{12.34 \ldots p}$.

(b) Suppose $X = (X_1, X_2, X_3)$ follows a trivariate normal distribution. Then show that

$$\rho_{12.3} = \frac{\rho_{12} - \rho_{13}\rho_{23}}{\sqrt{1-\rho_{13}^2}\sqrt{1-\rho_{23}^2}}$$

where $\rho_{12.3}$ is the partial correlation coefficient between X_1 and X_2 and ρ_{ij} is the simple correlation coefficient between X_i and X_j.

(c) If $\rho_{1j} = \rho \ (j = 2, 3, \ldots p)$ and $\rho_{ij} = \rho' \ (i, j = 2, 3, \ldots, p; i \neq j)$, what are the values of the multiple correlation coefficient $R_{1.23 \ldots p}$ and the partial correlation coefficient $\rho_{12.34 \ldots p}$ [2+8+4+4=18]

7. For a given distribution function F, a measure of dispersion is the semi-interquartile range $R = \frac{1}{2}(\xi_{3/4} - \xi_{1/4})$, where ξ_p is the p-th quantile of the distribution. Let $\hat{\xi}_p$ be the corresponding sample quantile based on a random sample of size n, so that $\hat{R} = \frac{1}{2}(\hat{\xi}_{3/4} - \hat{\xi}_{1/4})$. Show that the asymptotic distribution of $\sqrt{n}(\hat{R} - R)$ is normal with mean zero and some variance V. Find an expression for V in terms of the population cumulative distribution function F, and corresponding probability density function f. Calculate the value of R and V when F is the $N(\mu, \sigma^2)$ distribution. [12]

INDIAN STATISTICAL INSTITUTE

B. STAT (HONS) II YEAR : 1999-2000

SEMESTRAL – II EXAMINATION

Date : 4.5.00 *Time : 3 hours*

Maximum Marks : 100

GROUP A : DEMOGRAPHY

Note : Answer Q. 5 and any **THREE** from the rest

1. a) Define Census. Describe various systems of census and their drawbacks.

b) Derive a formula for evaluating errors in reporting ages between 10 and 99 years from census data.

d) Assume that the preference for digits in age reporting spreads around four year-age intervals. Show that :

$$C_X = \frac{1}{5}\left(\frac{4}{AR_X} + 1\right)$$

Where C_X = correction factor for age x,

and AR_X = Age ratio at age x for a four year age interval.

5+5+5=15

2. a) Derive the expression for instantaneous growth rate of a population.

b) Fit the logistic curve through Hotelling's method. What are assumptions involved in fitting the logistic curve through this method ? What is its difference with Fisher's method ?

c) Compare Infant Mortality Rate and Infant Death Rate.

5+6+4=15

P.T.O

3. An aviary of female birds which has a constant intake of 1500 new-born female birds per year experiences the following events :

Age (x)	q_x (for females: prob. of dying)	f_x (age specific fertility rate for females birds to thousand females)
0	0.3	0
1	0.1	1
2	0.2	2
3	0.4	2
4	0.7	1
5	1.0	0

i) What is the total number of female birds in the aviary at any time ?

ii) If the owner wanted the population to be a steady 5000 female birds, how many extra new born birds would have to be added in each year.

iii) What is the gross reproduction rate ?

iv) What is the net reproduction rate of these birds ?

5+4+2+4=15

4. a) Derive the singulate mean age at marriage for a female population where 10 per cent females remain never married in their life.

b) You are supposed to estimate total fecundity (TF) through Bongaart's Model. Describe various type of data that are needed to compute TF and describe the procedure to compute TF.

Interpret : TF, index of marriage, index of contraception and abortion and index of post partum infecundity.

6+5+4=15

5. *Indicate the correct answer*

i) A high sex ratio :

a) indicates a high proportion of males in the popultion

b) indicates a low proportion of males in the population

c) indicates a high proportion of infants in the population.

ii) *The difference between a generation life table and a period life table is that :*

a) the radix is different
b) one refers to a true birth cohort and the other does not.
c) one uses a different method for calculating q_0 than the other.
d) none of the above

iii) *Population with net reproduction rate 1000 per 1000 women :*

a) invariably have low age specific fertility rates
b) have low crude death rates but may have high age-specific fertility rates.
c) have declining age specific fertility rates
d) none of the above

iv) *Open birth intervals are likely :*

a) to be longer than closed birth intervals,
b) to be shorter than closed birth intervals
c) to be about the same length as closed birth intervals.

v) *If the death rate of a stationary life table population is 10 per thousand life table population, this implies a life expectancy of about :*

a) 10 years
b) 30 years
c) 50 years
d) 100 years

1x5 =5

P. T. O

INDIAN STATISTICAL INSTITUTE

B.Stat. (Hons.) II Year (1999-2000) Semestral II Examination

Date of Exam. : 04 MAY 2000

SQC & OR

Maximum Marks : 50 Duration : 1.5 hrs.

GROUP – B

Symbols used have their usual meanings.

Answer Q1 or Q2 and the rest.

1. The following table gives the rejection of a foundry item over a week from 03.10.99 t 10.10.99. 4 random samples of size 25 each were taken a . Set up a suitable contro chart to examine whether the process was under control.

The process was examined thorughly for a week and some technical actions called for wer taken. Again 4 random samples of size 25 each were taken a for the period fro 17 to 24 October 1999

Plot these sample observations on the previous control chart (3-10.10.99). Do you thi there was any improvement in rejection during the second period.

Date	Number of defectives Before action			
October 03	0	0	0	0
04	0	5	0	9
05	2	0	0	0
06	0	5	1	0
08	0	0	9	3
09	3	5	0	3
10	0	4	7	2
	After action			
17	0	1	0	0
18	1	0	0	0
19	0	0	0	0
21	0	0	0	1
22	1	2	2	1
23	0	0	0	0
24	0	0	2	1

[1(

2. Solve the following LP problem using simplex algorithm presenting the

$$\text{Max } Z = 5X_1 + 3X_2$$

Subject to

$$3X_1 + 5X_2 \le 15$$
$$5X_1 + 2X_2 \le 10$$
$$X_1, X_2 \ge 0$$

[10]

3. Answer any two questions :

a) What do you understand by process capability ? Explain how the knowledge of process capability helps in devising a suitable control procedure.

b) Explain clearly the concept of rational subgroup highlighting its importance in quality control work.

c) Is an X-R chart it was observed that some of the recent most points in R chart was out of control and a few points were outside both UCL and LCL in the X-chart though the majority of the points were written the control limit for X chart. How would you explain the situation.

[10 + 10 = 20]

4. Answer any two questions :

a) Show that a basic feasible solution of a LP problem is an extreme point of the convex set of feasible solutions.

b) How would you convert a feasible LP solution to a basic feasible solution ?

c) State and prove the conditions for unbounded solutions of a LP problem.

d) State and explain the meaning and importance of complementary property of a LP problem.

[10 + 10 = 20]

INDIAN STATISTICAL INSTITUTE

B.Stat. (Hons.) II and III Year (1999-2000) Semestral II Examination

Date of Exam. : 05 MAY 2000

ANTHROPOLOGY

aximum Marks : 100 Duration : **3 hrs.**

GROUP – A

nswer any five questions.

. How do you define Anthropology ? What are the distinguishing features of Anthropology ? (2+8 = 10)

!. Why is man unique in the animal kindgom ? (10)

i. Describe the salient features of Darwin's theory of evolution. Bring out the weakness of ~~this thing~~ this theory. (10)

l. Define Adaptation. What is the difference between Adaptation and Acclimatization. (2+8 = 10)

5. Write short notes on any two of the following :

a) Marriage and Mating, b) Stable and Stationery Population, c) Race, d) Adaptive significance of skin colour, e) Homo erectus. (2 x 5 = 10)

6. Compare and Contrast the morphological features of Man and Chimpanzee. (10)

P. T. O

GROUP – B

Answer any five questions.

1. What is chromosome ? Describe the structure and function of chromosome. (2 + 8 = 1
2. What is Mutation and how does it affect the Hardy-weinberg equilibrium ? (2 + 8 = 1
3. Describe the various forms of chromosomal anomalies. (10)
4. Distinguish between the following (any two).

   a) Phenotype – Genotype
   b) Homozygote – Heterozygote
   c) DNA – RNA (2 x 5 = 1
5. What are the laws of Mandal. Describe with suitable examples. (4 + 6 = 1
6. Distinguish between Admixture and Inbreeding (10)
7. Write short notes of any two :

   a) Nucleus, b) Gene and ~~Alble~~ Allele, c) Twin, d) X- and Y- Chromosome, e) Polygenic Inheritan
   (2 x 5 =

INDIAN STATISTICAL INSTITUTE

SECOND SEMESTRAL EXAMINATION (1999-2000)
B.STAT (Hons.) - II & III yr.
ECONOMICS – II

DATE OF EXAMINATION : 20 APRIL 2000

Maximum Marks : 100 GROUP – A Duration : 3.5 hrs.

Answer any five questions, taking at least two from each group

Answer Goups A & B in separate answerscripts.

1. a) Consider a simple keyesian model (S.K.M.) for a closed economy (you may ingnore govt activities. Explain what is menat by unplanned inventory accumulation and derive the relationship among aggregate planned saving, aggregate planned investment and unplanned inventory accmmulation for any arbitrary level of Y.

   b) Consider a S.K.M. for a closed economy without govt. Suppose consumption (C) is a linear function of income (Y) and C=80 when Y=O, investment function is given by I=200 + .1Y; when Y=4800 the unintended inventory accumulation is 140. Derive the saving fucntion.

   [12 + 8 = 20]

2. a) In a S.K.M. for a closed economy with Govt., aggregate planned demand

   $E = C+I+G$

   $C + A+C.Y^d$, $a>0$, $0<c<1$

   $Y^d = Y-T$

   $T = \bar{T}$, $I = \bar{I}$, $G = \bar{G}$

   Derive the relationship between private saving and public saving that exists in equilibrium. Now suppose $\bar{T}$ increases. Find out its effect on total saving (private + public), public saving and private saving in the new equilibrium.

   b) How do the results change if the investment function is replaced by

   $I = \bar{I} + i.Y$, $0<i<1$

   [14 + 6 = 20]

3. How would you extend the model of 2a) when planned investment is a function of rate of interest. Derive the Govt. expenditure multiplies for the extended model. Compare it with the corresponding multiplier of the model in (2a) above. Explain your answer. [20]

4. Consider an IS-LM model for a small open economy with perfect capital mobility under a perfectly flexible exchange rate regime. Show that the fiscal policy is totally ineffective in this model. [20]

P. T. O

GROUP – B

5. [redacted] How will you present the accounting framework of an economy with n production [redacted]ors, a household sector, the government sector and the rest of the world sector.

Using the information given beow estimate gross domestic product at Market Prices [redacted]s. in crore)

		(Rs. in crore)
1.	Private Consumption Exp.	50,000/-
2.	Govt. Consumption Exp.	15,000/-
3.	Gross Fixed Capital Formation	10,000/-
4.	Increase in stocks	2,000/-
5.	Exports of Goods & Services	5,000/-
6.	Imports of Goods & Services	7,000/-
7.	Capital consumption allowances	6,500/-
8.	Net Indirect Taxes	5,000/-
9.	Net Foreign Income	5,000/

6. Discuss the dichotomisation of the pricing process in classical Macroeconomics. [20

7. Consider the extended classical Macroeconomic system and work out the changes in the equilibrium values of Y, N, $\frac{W}{P}$, r, and P, resulting from the parameter shifts as follows. [2

a) Saving schedule shifts to the right.

b) Money supply increases © supply of labour schedule shifts to the right. Take the standard meaning of the relations.

8. Write short notes on any two of the following. [10+

a) Wicksell's reformulation of the classical Macroeconomic System

b) Say's law of Markets (3) Effect of wage rigidity on the classical macrosystem.

INDIAN STATISTICAL INSTITUTE

B.STAT. (Hons.) II Year (1999-2000) Semestral II Examina[redacted]

Date of Exam. : 8.5.2000

ECONOMIC STATISTICS & OFFICIAL STATISTICS [redacted]

Duration [redacted].

imum Marks : 100

nswer four questions from Group A and one question from Group B. All questi[redacted]rry equal marks.

) Obtain the k^{th} order moment, the Lorenz Curve (LC) and the Lore[redacted] Ratio (LR) a Pareto distribution.

) Suppose that the LR and the mean income of persons in a community are 0.4 d Rs. 700/- respectively. If the poverty line is Rs. 600/-, then estimate the head unt ratio and the income gap ratio of incomes of persons in the community. (You y assume that the income variate follows a Pareto distribution). [6 + 14 = 20]

a) State and Prove the properties of the Lorenz Curve (LC) when the size variable lows a Log-normal (LN) distribution.

b) State the principle of 'Diminishing Transfer of Income'. Examine the equality measures CV, LR and SD (log) in the light of the above principle, where e terms have the usual meaning. [8 + 12 = 20]

Suppose the Engel elasticity of a specific commodity is positive. Is it true that e demand of the commodity will always increase if the average income of the mmunity increases ? Explain with specific examples. [20]

Describe how the effect of household size can be explained using ais-Houthakker's formulation of Engel Curve. Also describe one estimation rocedure of such Engel curves. [10 + 10 = 20]

What are the relations between true cost of living index numbers and the aspeyre's (L) and Paasche's (P) index numbers ? Verify whether the true index hould always lie between L and P ? [8 + 12 = 20]

P.T.O

6. Write [illegible] rt notes on any four of the following :

a) [illegible] ectives of Time-series Analysis.
b) [illegible] ner's Tests for Index Numbers.
c) [illegible] 's index of poverty
d) [illegible] composition of poverty measures
e) [illegible] teroscedastic errors in Engel Curves.
f) [illegible] cial Welfare Function Approach to the inequality measures.

[4 x 5 = 20]

GROUP – B

7.a) Mention the major limitations of population census data in India.

b) Give an account of the Sample Registration Systems and the results ob[illegible] from this system. [8 + 12 = 2[illegible]

8.a) Give an account of NSS consumer expenditure data mentioning wh[illegible] known about their validity.

b) How are poverty estimates for India computed for such data ?[12 + 8 = 2[illegible]