

(STA30115)

M.Sc. DEGREE EXAMINATION,
OCTOBER/NOVEMBER 2017.

Third Semester

Statistics

Paper I — DESIGN OF EXPERIMENTS

(Regulation 2015)

Time : Three hours

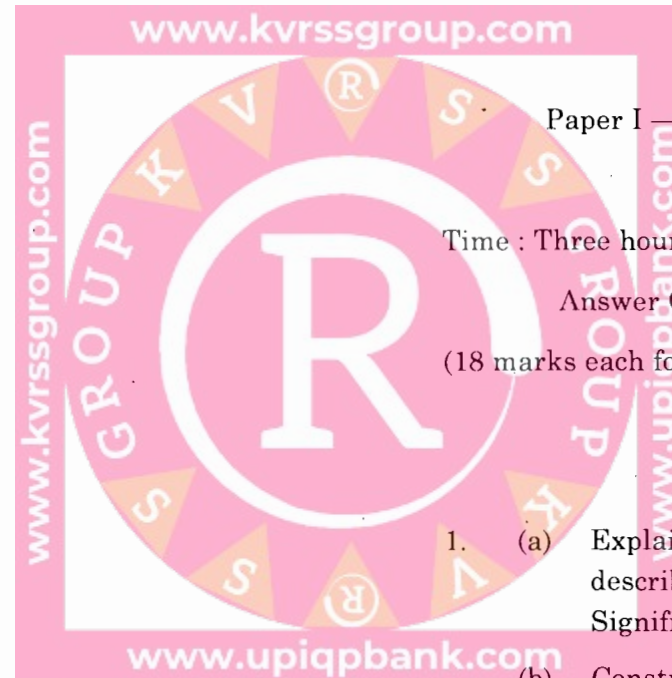
Maximum : 70 marks

Answer ONE question from each Unit.

(18 marks each for Unit I and Unit II, 17 marks each for
Unit III and Unit IV)

UNIT I

1. (a) Explain factorial effects and how can we describe best estimates and testing the Significance of factorial effects.
(b) Construct a partially confounded 3^2 factorial design in blocks of 3 each by confounding AB and AB^2 in the first and second replicates respectively.



2. (a) Explain the main effects and intersections in 2^n factorial experiment. Explain Yates procedure for a 2^2 factorial.
- (b) Construct a total confounded 3^3 factorial experiments with a suitable example.

UNIT II

3. (a) Explain balanced incomplete block design and prove the parametric relations in a BIBD. Explain a method of constructing BIBD.
- (b) Explain resolvable and affine resolvable designs. For a resolvable BIBD, in the usual notation prove that $b \geq v + r - 1$.
4. (a) Explain Partially balanced incomplete block design (PBIBD) and prove the parametric relations in PBIBD.
- (b) Describe PBIBD with intra block analysis.

UNIT III

5. (a) Explain Simple lattice design. Discuss the analysis of Youden square design.
- (b) Explain Strip plot design and their analysis.
6. (a) Explain Gracco Latin square design.
- (b) Explain Split plot design and their analysis.

UNIT IV

7. (a) Distinguish between response surface designs and linear response surface designs.
- (b) Obtain the variance of the estimated second order response surface.

8. (a) Describe Rotatable designs with a suitable examples.
- (b) Explain the conditions for second order rotatable designs.

(STA30215)

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Paper II — STATISTICAL QUALITY CONTROL

(Regulation 2015)

Time : Three hours

Maximum : 70 marks

Answer ONE question from each Unit.

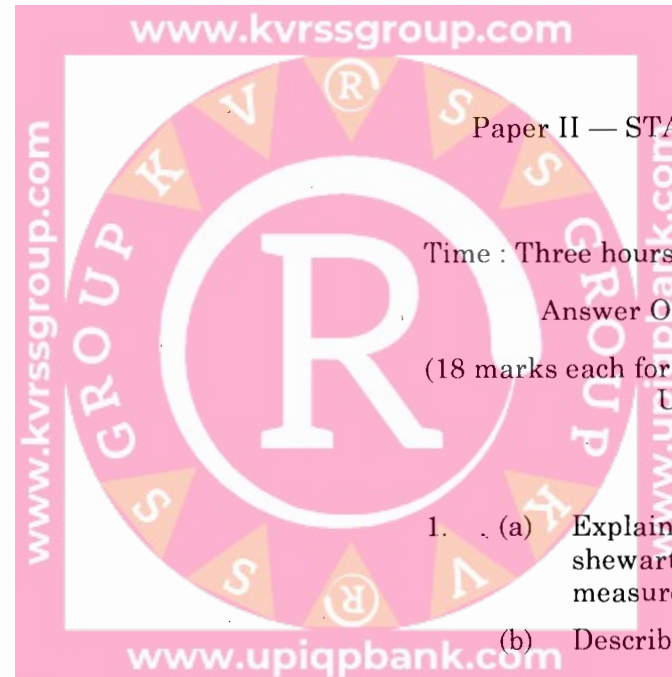
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Unit III and Unit IV)

UNIT I

1. (a) Explain \bar{x} and S charts and write the shewart control charts for individual measurements.
(b) Describe Average run length for \bar{x} chart.

Or

2. (a) Obtain charts for individual measurements.
(b) Explain CUSUM chart. How do you improve CUSUM responsiveness for large shifts?



UNIT II

3. (a) Describe the acceptance sampling problem and write the advantage and disadvantages of sampling.
- (b) Define Double sampling plan. Obtain OC curve for the plan. Discuss the effect of the constants n and c on the OC curve.

Or

4. (a) Obtain the graphical performance of Sequential sampling plans.
- (b) Describe the Sampling plan standards. Explain the ADQL plans LTPD plans.

UNIT III

5. (a) Define acceptance sampling by variables. Write its merits and demerits.
- (b) Discuss MIL-STD 414 standard and its uses.

Or

6. (a) Explain Notion of sequential sampling plan by variables. What do you understand by non-conforming sampling plan?
- (b) Explain ADQL plans and LTPD plans with a suitable example.

UNIT IV

7. (a) Describe the reliability characteristic.
- (b) Explain the notion of
- (i) IFR
 - (ii) CFR and
 - (iii) DFR. Obtain the failure rate of Weibull model and examine its features.

Or

8. (a) Define MTTF. Obtain for Weibull model.
- (b) Explain series and parallel systems. Obtain the reliabilities of these systems in the case of exponential failure model.

(STA30315)

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Statistics

Paper IV — OPERATIONS RESEARCH

(Regulation 2015)

Time : Three hours

Maximum : 70 marks

Answer ONE question from each Unit.

(18 marks each for Unit I and Unit II, 17 marks each
for Unit III and Unit IV)

UNIT I

1. (a) Explain :

(i) Saddle Point.

(ii) Optimal Strategies.

(iii) Minimax criterion.

(iv) The ebullience of Matrix game.

(b) Solve the following game graphically.

	B_1	B_2	B_3
A_1	1	3	11
A_2	8	5	2

2. (a) Solve the following game by linear programming.

	B_1	B_2	B_3
A_1	3	-1	-3
A_2	-3	3	-1
A_3	-4	-3	3

- (b) State and Minimax Theorem.

UNIT II

3. (a) Explain purchase model with instantaneous replenishment and with out shortages.
 (b) Derive an inventory model with one price break and obtain the decision rules for finding optimal order quantity.
4. (a) Explain purchase model with instantaneous replenishment and with shortages.
 (b) Explain manufacturing model with shortages.

UNIT III

5. (a) Explain the model $\{M/M/1\}: (\infty/FCFS)$, and also find the average waiting time of a customer in the queue.
 (b) Explain $\{M/M/1\}: (N/FCFS)$ system and solve it under steady state condition.

6. (a) In $M/E_K/1$ queuing model, find the steady state distribution of the queue size. Derive the average waiting time in the queue.
 (b) Explain $M/G/1$ system. Drive Pollazek-Khinchine formula.

UNIT IV

7. (a) Discuss the problems of replacement of items that deteriorate with time.
 (b) Explain briefly the difference in replacement policies of items which deteriorate gradually and items which fails completely.
8. (a) Distinguish between group replacement and individual replacement policies.
 (b) Explain present worth factor $(P/F, i, n)$ with a suitable example.

(STA304A15)

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Statistics

Paper III — COMPUTER INTENSIVE STATISTICAL
METHODS

(Regulation 2015)

Time : Three hours

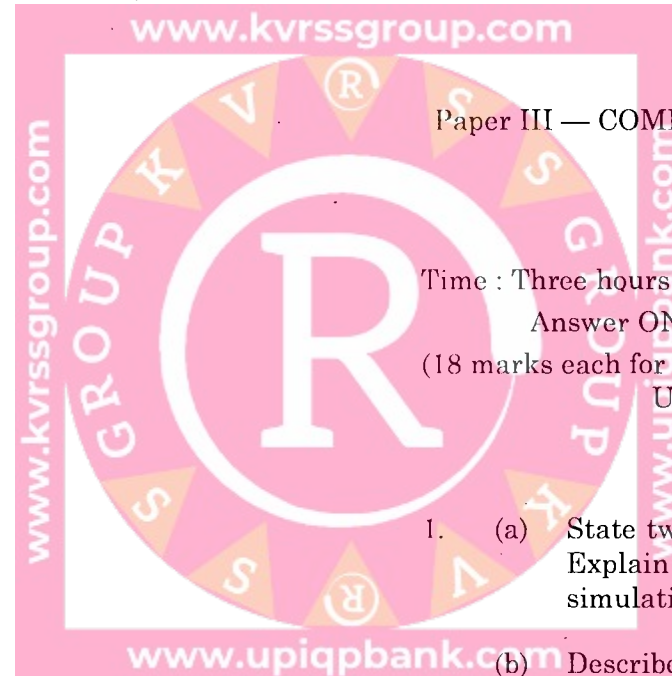
Maximum : 70 marks

Answer ONE questions from each Unit.

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Unit III and Unit IV)

UNIT I

1. (a) State two major reasons of using simulation. Explain the basic steps of Monto-Carlo simulation.
(b) Describe the methods of generation.
2. (a) Explain tests of randomness frequency test.
(b) Discuss the methods of generating Non-Uniform random numbers.



UNIT II

3. (a) Explain the generation of (i) Exponential and (ii) Erlang variates and write the algorithms
- (b) Explain the generation of (i) Weibull and (ii) Poisson variates and write the algorithms.
4. (a) Explain the generation of (i) Empirical and (ii) lognormal variates and write the algorithms.
- (b) Explain the generation of (i) Beta and (ii) Geometric variates and write the algorithms.

UNIT III

5. (a) Define simulation. Discuss any four applications of queuing and inventory areas of simulation.
- (b) Explain the reliability estimation in the case of exponential failure model using simulation.
6. (a) Describe the general characteristics of simulation languages.
- (b) Why would an analyst ever prefer a general purpose language such as FORTRAN or BASIC in a simulation, when there are advantages of using special purpose languages such as GPSS or SIMULA?

UNIT IV

7. (a) Explain (i) stratified sampling and (ii) importance sampling and give their applications are each
- (b) Explain the Bootstrap method of estimating standard error and write the algorithms.
8. (a) Explain common random variables and antithetic variables.
- (b) Describe Jackknife method with a suitable example.