

(STA 30115)

M.Sc. DEGREE EXAMINATION, DECEMBER 2019.

Third Semester

Statistics

Paper I — DESIGN OF EXPERIMENTS

(Regulation 2015)

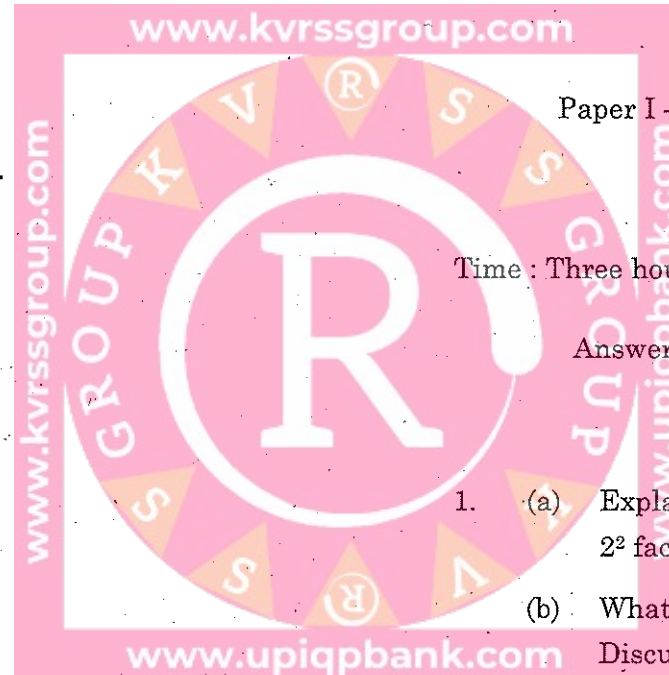
Time : Three hours

Maximum : 70 marks

Answer ONE question from each unit.

UNIT I

1. (a) Explain the effects and intersections in 2^2 factorial experiment.
(b) What are General Factorial Experiments? Discuss.
2. (a) What is a best estimate? Explain.
(b) Construct a 2^n factorial experiment in general.



UNIT II

3. (a) What is intra block analysis? Explain.
(b) Prove parametric relations in a BIBD.
4. (a) Explain the method of constructing PBIBD with two associate classes.
(b) Discuss the PBIBD with intra block analysis.
8. (a) Discuss 'Balanced Incomplete Block Design'. Explain the procedure.
(b) Discuss the conditions for second order rotatable designs in detail.

UNIT III

5. (a) What is Strip Plot Design? Discuss its analysis.
(b) Explain Gracco Latin Square Design.
6. (a) Explain Simple Lattice Design. Discuss its analysis procedure.
(b) Explain Youden Square Design. Also discuss its analysis procedure.

UNIT IV

7. (a) What is response surface methodology? Discuss in detail.
(b) What is linear response surface designs? Explain in detail.

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Statistics

Paper II — STATISTICAL QUALITY CONTROL

(Regulation 2015)

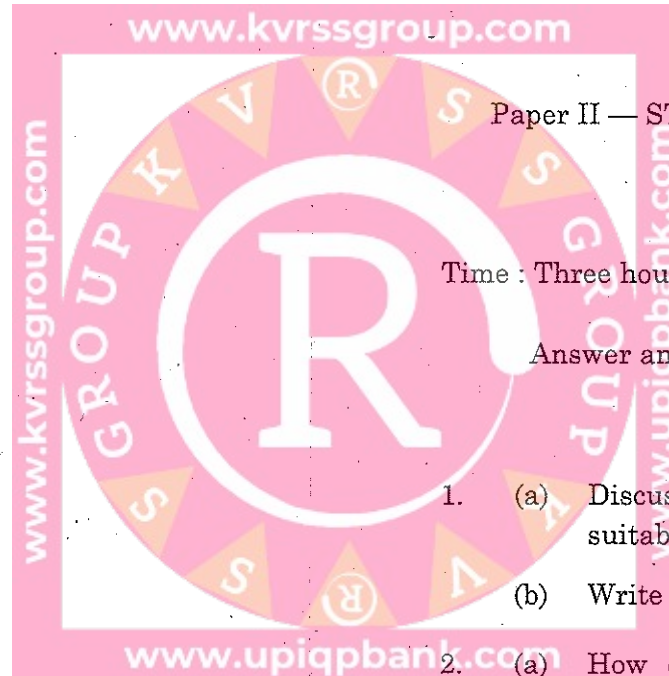
Time : Three hours

Maximum : 70 marks

Answer any ONE question from each Unit.

UNIT I

1. (a) Discuss the control charts for variables with suitable examples.
(b) Write the uses of \bar{X} Chart and R Chart.
2. (a) How do you construct S-Chart? Write its applications.
(b) What is CUSUM Chart? Discuss the recommendations for CUSUM Design.



UNIT II

3. (a) What are the elements of AOQL? Discuss in brief.
- (b) Derive the graphical performance of sequential sampling plan.
4. (a) How do you design single sampling with OC curve? Discuss.
- (b) Write the elements of LTPD. Explain in detail.

UNIT III

5. (a) Discuss the types of variable sampling plans.
- (b) Write the construction of sampling plan for variable with OC curve.
6. (a) Discuss the procedure of MILSTD414. Discuss in detail.
- (b) Write the notation and procedure of a sequential sampling plan.

UNIT IV

7. (a) What is reliability? Write the characteristics of reliability.
- (b) Explain the concepts of (i) IFR, (ii) DFR.
8. (a) How do you test reliability in the case of Exponential Model? Discuss.
- (b) Explain MTTF for Exponential Distribution.

UNIT IV

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Third Semester

Statistics

Paper III — OPERATIONS RESEARCH

(Regulation 2015)

Time : Three hours

Maximum : 70 marks

Answer ONE question form each unit.

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

UNIT I

7. (a) Describe the problem of replacement of items whose maintenance costs increase with time and value of money remains constant.
 (b) Explain the following:

- (i) Present worth factor
 (ii) Equal payment series capital recovery factor
 (iii) Individual and group replacement policies.

8. (a) Explain group replacement concept and its applications.
 (b) Following failure rates have been observed for a certain type of light bulbs:

Week:	1	2	3	4	5
Percent failing at the end of one week:	10	25	50	80	100

There are 1000 bulbs in use and it costs Rs.10 to replace an individual bulb which has burn out. If all the bulbs are replaced simultaneously, it would cost Rs.4 per bulb. It is proposed to replace all bulbs at fixed intervals of time, whether or not they have burnt out, and to continue replacing burnt out bulbs as and when they fail. At what intervals all the bulbs should be replaced?

1. (a) Explain the following terms:

- (i) Pure and mixed strategies
 (ii) Value of the game and saddle point
 (iii) Maximin criterion
 (iv) Dominance principle

- (b) Solve the following 2 × 4 game graphically:

		B			
		B_1	B_2	B_3	B_4
A	A_1	$\begin{bmatrix} 2 & 1 & 0 & -2 \end{bmatrix}$			
	A_2	$\begin{bmatrix} 1 & 0 & 3 & 3 \end{bmatrix}$			

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

		Player B		
		1	2	3
Player A	1	3	-1	-3
	2	-3	3	-1
	3	-4	-3	3

- (b) For what values of a the game with the following payoff matrix is strictly determinable?

		B		
		B_1	B_2	B_3
A	A_1	a	6	2
	A_2	-1	a	-7
	A_3	-2	4	a

UNIT II

3. (a) Discuss various inventory costs. Give the classification of different inventory models.
- (b) Describe the production inventory model with no shortages and with instantaneous replenishment and derive the optimum lot size formula.
4. (a) Describe the purchase inventory model with shortages.
- (b) Find the optimal order quantity for a product for which the price breaks are as follows:

Quantity	Unit cost (Rs.)
$0 \leq Q_1 < 800$	Rs. 1.00
$800 \leq Q_2$	Rs. 0.98

The yearly demand for the product is 1600 units, cost of placing an order is Rs.5, and the cost of storage is 10% per year.

UNIT III

5. (a) Explain the following:
- (i) Steady state and traffic intensity of a queue model.
 - (ii) Operating characteristics of queueing system
 - (iii) The role of exponential distribution in queueing theory.
- (b) Explain $M/M/1:\infty/FCFS$ queue and solve the system under the steady state.
6. (a) Obtain the solution of $M|E_k|1:\infty/FIFO$ queue and derive an expression for the average waiting time in the queue.
- (b) Derive the Pollaczek-Khintchine (P-K) formula for the $M|G|1$ system.

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Statistics

Paper III — COMPUTER INTENSIVE STATISTICAL
METHODS

(Regulation 2015)

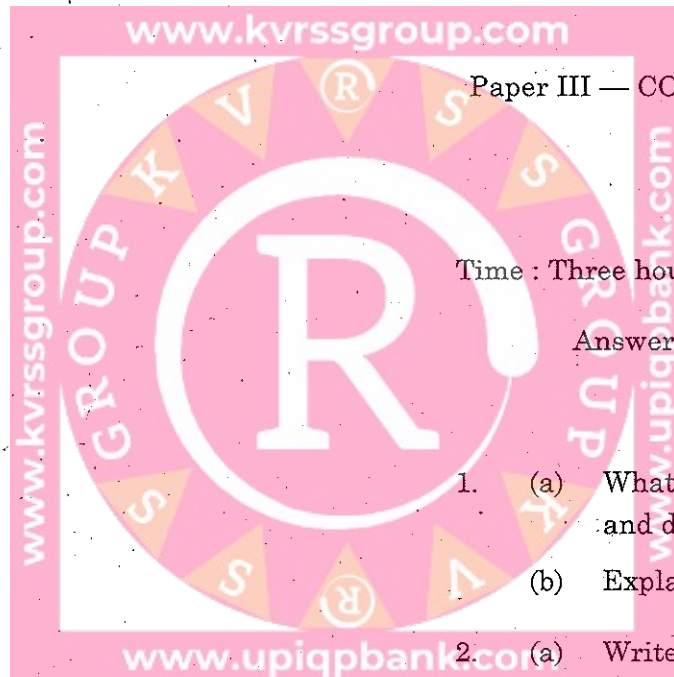
Time : Three hours

Maximum : 70 marks

Answer ONE question from each Unit.

UNIT I

1. (a) What is simulation? Discuss its advantages and disadvantages.
- (b) Explain simulation with suitable examples.
2. (a) Write the properties of uniform random numbers.
- (b) Explain the steps in Runs test for Randomness.



UNIT II

3. (a) Discuss the procedure to generate non-uniform random numbers from (i) Gama, (ii) Log Normal Distributions.
- (b) Write the algorithm for generation of non-uniform random numbers from (i) Triangular, (ii) Negative Binomial Distribution.
4. (a) How can you generate non-uniform random numbers from Empirical Distributions? Discuss.
- (b) Explain the procedure to generate non-uniform random numbers from (i) Bernouli, (ii) Weibull Distributions.

UNIT III

5. (a) Discuss the applications of simulation in inventory management.
- (b) Explain the reliability estimation in life testing models.

6. (a) Write the general characteristics of SIMULA.
- (b) Discuss the general characteristics of SIM SCRIPT.

UNIT IV

7. (a) What is stratified random sampling? Discuss its procedure.
- (b) What is sampling? Write the importance of sampling.
8. (a) Discuss Boot Strap Method with suitable example.
- (b) Discuss Conditional Monte-Carlo Method.