**P.R.GOVERNMENTCOLLEGE(A), KAKINADA**

**III B.Sc. – Statistics/ Semester- V / Paper-VII (A) Syllabus (2018-19)**

**Paper Title: SQC & OPTIMIZATION TECHNIQUES**

Total Hours of Teaching: 48 @ 3 h / Week

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**Objective:** The main objective of SQC is to achieve quality in production and service organizations, through the use of adequate statistical techniques.

**Operational Research –I:** In British usage, is a discipline that deals with the application of advanced analytical methods to help make better decisions. It is often considered to be a sub-field of mathematics. Employing techniques from other mathematical sciences, such as [mathematical modeling](http://en.wikipedia.org/wiki/Mathematical_model), [statistical analysis](http://en.wikipedia.org/wiki/Statistics), and [mathematical optimization](http://en.wikipedia.org/wiki/Mathematical_optimization), operations research arrives at optimal or near-optimal solutions to complex decision-making problems. Operations research is often concerned with determining the [maximum](http://en.wikipedia.org/wiki/Maxima_and_minima) (of profit, performance, or yield) or minimum (of loss, risk, or cost) of some real-world objective. Originating in military efforts before World War II, its techniques have grown to concern problems in a variety of industries

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**Module-1 Statistical Quality Control (12h)**

1. Importance of SQC in industry. Process and Product control, Shewart control charts. Construction of control charts for variables (mean, range and standard deviation) and attributes (p, np and c - charts with fixed and varying sample sizes). Interpretation of control charts.
2. Acceptance sampling plans: Producers risk and consumer’s risk. Concept of AQL and LTPD. Single and Double sampling plans for attributes and derivation of their OC and ASN functions. Design of single and double sampling plans for attributes using Binomial.

**Module – 2 Reliability: (10h)**

1. Introduction. Hazard function, Exponential distribution as life model, its memory- less property. Reliability function and its estimation. System reliability - series, parallel and k out of N systems and their reliabilities.

**Module -3 Introduction of OR and LPP: (14h)**

1. Linear Programming: Meaning and scope of OR, applications of OR, Convex sets and their properties. Definition of general form of LPP. Formulation of LPP, Fundamental theorem of LPP. Solution of LPP by graphical method.
2. Linear Programming: slack and surplus variable, simplex algorithm.

**Module – 4 Artificial variable technique and duality: (14h)**

1. Concept of artificial variables. Big –M/Penalty method and two-phase simplex methods. Concept of degeneracy and resolving it, Concept of duality, duality as LPP. Dual and Primal relationship. Fundamental theorem of duality.

1. Introduction to reliability
2. Hazard function & MLE of Hazard function
3. Memory less property of exponential distribution
4. Reliability function & it’s estimation
5. Concepts of censoring & truncation
6. Types of Systems in reliability
7. Series & Parallel configuration

**Paper –VII(A): SQC & OPTIMIZATION TECHNIQUES**

**Model blue print for the Question Paper setter**

**Max. marks: 70 Time : 3 Hrs.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Unit / Chapter name** | **Very Short Answer Questions** | **Short Answer Questions** | **Essay Questions** | **Marks allotted to the Unit/Chapter** |
| **Unit – 1** |
| **Statistical Quality Control** | **2** | **2** | **2** | **32** |
| **Unit – 2** |
| **Reliability** | **1** | **2** | **2** | **31** |
| **Unit – 3** |
| **Introduction to OR and LPP** | **1** | **2** | **2**  | **31** |
| **Unit – 4** |
| **Artificial variable technique and duality** | **1** | **2** |  **2** | **31** |
| **Any of the above Units (i.e., 1-4)** |
| - |  |  |  |  |
| **Total No. of Questions including choice (21)** | **5** | **8** | **8** | **-** |
| **Total marks allotted to all questions including choice =** | **125** |

**P.R. Government College (Autonomous), Kakinada**

**III year B.Sc., Degree Examinations- V Semester**

**Statistics VII(A)**: **SQC & OPTIMIZATION TECHNIQUES**

 **(Model paper)**

**Time: 3 Hrs. Max. Marks: 70**

**Section-A**

**Answer all questions: 5x1=5M**

1. Define process control.
2. Draw the chart for control limits.
3. Define reliability
4. Define LPP
5. Define slack .

 **Section – B 5x5 = 25 M**

**Answer any five of the following questions. Each question carries five marks.**

1. Explain the terms of assignable and chance causes.
2. How do you construct the p-chart.
3. Explain AQL and LTPD.
4. Explain reliability function and it’s estimation.
5. Derive maximum likelihood estimate of exponential function.
6. Write canonical and standard form of LPP.
7. State and prove fundamental theorem of LPP.
8. Explain artificial variable .
9. Explain concept of duality.

 **Section – C 2x10 = 20 M**

**Answer any two questions.**

14. What are control charts. How do you construct x and R- charts.

 15. Explain the control charts for attributes. How are they useful.

 16. What are the uses of statistical quality control. Explain the statistical basis of

 control chart analysis.

 17. Define Six sigma and explain it’s importance in statistical quality control.

 **Section – D 2x10 = 20 M**

**Answer any two questions.**

**18.** solve the following LPP by simplex method.

Max.Z=5x1+10x2+8x3

 Sub. To constraints

 3x1+5x2+2x3<60

 4x1+4x2+4x3<72

 2x1+4x2+5x3<100

 x1,x2,x3>0

19. Explain the procedure for two phase method. State and prove dual of a dual is primal.

20. Write algorithm for two phase simplex method?

21. Explain importance of exponential distribution as a failure model. State and prove memory less property of exponential distribution.

**P.R. Government College (Autonomous), Kakinada**

**Semester paper V- Paper VII (B)**

**Title: Actuarial Statistics**

 (Total Hours of Teaching: 60@ 3 h / Week)

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 **Module -1 (15h)**

Utility theory, insurance and utility theory, models for individuals claims and their sums, survival function, curate future lifetime, force of mortality.

Life table and it’s relation with survival function examples, assumptions of fractional ages, some analytical laws of mortality select and ultimate tables.

**Module - 2** **(15h)**

 Multiple life functions, joint life and last survivor status, insurance and annuity benefits through multiple life functions, evaluation for special mortality laws.

Multiple decrement models, deterministic and random survivorship groups, associated single decrement tables, central rates of multiple decrement, net single premiums and their numerical evaluations.

**Module - 3** **(15h)**

Elements of compound interest (nominal and effective rate of interest)

Life annuities: Single payment, continuous life annuities, discrete life annuities, life annuities with monthly payments, communication functions, varying annuities-due recursions and complete annuities-immediate and apportionable annuities-due.

 **Module - 4 (15h)**

Net premiums: Continuous and discrete premiums, true monthly payment premiums, apportionate premiums, communication functions, and accumulation type benefits.

Net premium reserves: continuous and discrete net premium reserve, reserves on a semi continuous basis, reserves based on true monthly premiums, reserves on an apportionable or accounted continuous basis reserves at fractional durations.

**Paper Title-ACTURIAL STATISTICS VII (B)**

**Model blue print for the Question Paper setter**

**Max. marks : 70 Time : 3 Hrs.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Unit / Chapter name** | **Very Short Answer Questions** | **Short Answer Questions** | **Essay Questions** | **Marks allotted to the Unit/Chapter** |
| **Unit – 1** |
| **Module-I** | **2** | **2** | **2** | **32** |
| **Unit – 2** |
| **Module-II** | **1** | **2** | **2** | **31** |
| **Unit – 3** |
| **Module-III** | **1** | **2** | **2**  | **31** |
| **Unit – 4** |
| **Module-IV** | **1** | **2** |  **2** | **31** |
| **Any of the above Units (i.e., 1-4)** |
| - |  |  |  |  |
| **Total No. of Questions including choice (21)** | **5** | **8** | **8** | **-** |
| **Total marks allotted to all questions including choice =** | **125** |

**P.R. Government College (Autonomous), Kakinada**

**Paper Title: Actuarial Statistics**

**Semester V paper VII (B)**

**MODEL PAPER**

**Time : 3 Hrs. Max. Marks: 70M**

 **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**SECTION –A**

 **5X1 = 5 M**

**Answer all questions.**

1. Utility theory**.**
2. Life table.
3. Net single premium.
4. Single payment.
5. Continuous premium.

 **SECTION – B**

 **5x5 = 25 M**

**Answer any five of the following questions. Each question carries five marks.**

1. Explain insurance and utility theory.
2. Write force of mortality.
3. Explain multiple life functions.
4. Write about central rates of multiple decrement.
5. Write elements of compound interest.
6. Explain life annuities with monthly payments.
7. What is accumulation type benefits.
8. Explain true monthly premiums.

 **SECTION – C**

 **2x10 = 20 M**

**Answer any two questions.**

 14. Explain models for individual claims and their sums, survival function.

 15. Explain life table and it’s relation with survival function examples.

 16. Describe multiple decrement models, deterministic and random survivorship group

 17. Explain distribution of aggregate claims, compound Poisson distribution.

 **SECTION – D**

 **2x10 = 20 M**

**Answer any two questions.**

 18.Describe single payment, continuous life annuities, discrete life annuities.

 19. Explain recursions and complete annuities-immediate and apportionable annuities-due.

 20. Explain continuous and discrete premiums, true monthly payment premiums.

 21. Explain continuous and discrete net premium reserve, reserves on a semi continuous basis.

**P.R.Government College (Autonomous), Kakinada**

**III year B.Sc., Degree Examinations- VI Semester**

**Cluster A**

**Statistics Paper VIII A1: Operations Research**

**Time: 3 Hrs. Max. Marks: 70**

**Objective:** The central objective of operations research is [optimization](http://mathworld.wolfram.com/Optimization.html), i.e., "to do things best under the given circumstances." This general concept has great many applications, for instance, in agricultural planning, biotechnology, data analysis, distribution of goods and resources, emergency and rescue operations, engineering systems design, environmental management, financial planning, health care management, inventory control, manpower and resource allocation, manufacturing of goods, military operations, production process control, risk management, sequencing and scheduling of tasks, telecommunications, and traffic control.

**Module -1**

 **Transportation Problem (12h)**

 Definition of transportation problem,

 TPP as a special case of LPP,

 Feasible solutions by NWCR, MM, VAM

 Optimal solution through MODI

 Unbalanced transportation problem.

 Degeneracy in TP and resolving it.

**Module-2 (14h)**

 **Assignment Problem**

 Formulation and description of Balanced Assignment problem.

 Unbalanced assignment problem,

 Traveling salesman problem.

 Optimal solution using Hungarian method.

**Module –3**

**Sequencing**  **(10h)**

 Problem of Sequencing.

 Optimal sequence of N jobs on two and three machines without passing.

**Module –4**

**Game Theory** **(14h)**

Two Person Zero Sum Game

Saddle Point

Dominance property

Graphical Solution for mx2, 2xn

**List of text books:**

Operation Research by S.D.Sharma.

**Paper –VIII Cluster A1: Operations Research**

**Model blue print for the Question Paper setter**

**Max. marks:70 Time : 3 Hrs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Unit / Chapter name** | **Very Short Answer Questions** | **Short Answer Questions** | **Essay Questions** | **Marks allotted to the Unit/Chapter** |
| **Unit – 1** |
| **Transportation** | **1** | **2** | **2** | **31** |
| **Unit – 2** |
| **Assignment** | **1** | **2** | **2** | **31** |
| **Unit – 3** |
| **Sequencing** | **2** | **2** | **2** | **32** |
| **Unit – 4** |
| **Game Theory** | **1** | **2** |  **2** | **31** |
| **Any of the above Units (i.e., 1-4)** |
| - |  |  |  |  |
| **Total No. of Questions including choice (21)** | **5** | **8** | **8** |  |
| **Total marks allotted to all questions including choice =** | **125** |

**P.R.Government College (Autonomous), Kakinada**

**III year B.Sc., Degree Examinations-VI Semester**

**Statistics VIII Cluster A1**: **operations research**

 **(Model paper)**

**Time: 3 Hrs. Max. Marks: 70**

 **Section –A 5X1 = 5 M**

 **Answer all questions.**

1. Define unbalanced assignment problem.
2. Define optimal sequence.
3. Define mixed strategies.
4. Define payoff matrix.
5. Define transportation.

**Section – B 5x5 = 25 M**

 **Answer any five of the following questions. Each question carries five marks.**

1. Explain the procedure of travelling sales man problem.
2. Explain the procedure of unbalanced assignment problem.
3. Define idle time & total elapsed time.
4. Explain two machines and n jobs for the sequencing problem.
5. Explain the graphical method to solve rectangular game.
6. Give matrix method to solve mxn games.
7. What is unbalanced transportation problem.
8. What is degeneracy in transportation problem.

 **Section – C 2x10 = 20 M**

 **Answer any two questions.**

14. Define a transportation problem and explain the problem of degeneracy. Explain a method of resolving it.

15.Describe the MODI method to solve a transportation problem. Obtain an optimum solution to the following transportation problem.

 **D E F availability**

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| 6 | 4 | 6 |
| 3 | 2 | 1 |
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16. Explain the procedure of Hungarian Method.

17.Solve the following assignment problem

 Man/ job A B C D

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1 | 5 | 3 | 2 | 8 |
| 2 | 7 | 9 | 2 | 6 |
| 3 | 6 | 4 | 5 | 7 |
| 4 | 5 | 7 | 7 | 8 |

 **Section – D 2x10 = 20 M**

 **Answer any two questions.**

18.Write the Procedure to determine the sequence for performing the jobs to minimize total elapsed time T.

 19. Determine the optimal sequence of jobs that minimizes total based on the following information processing time on machines is given in hours and passing is not allowed.

 Job A B C D E F G

Machine M1: 3 8 7 4 9 8 7

Machine M2: 4 3 2 5 1 4 3

MachineM3: 6 7 5 11 5 6 12

20.Explain the minimax criterion as applied to the theory of games.

21. Solve the game whose payoff matrix is given by:

 Player B

 Player A

|  |  |  |
| --- | --- | --- |
| -1 | 2 | 1 |
| 1 | -2 | 2 |
| 3  | 4 | -3 |

**P.R.GOVERNMENT COLLEGE (A), KAKINADA**

**III B.Sc. – statistics / Semester- VI (W.E.F. 2017-2018)**

**Paper –VIII** (A2)

**Course: Cluster (A2): Advanced Designs of Experiment**

(Total Hours of Teaching: 45 @ 3 h / Week)

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**Objectives:** Statistics is an inductive science in which information is extracted from sample data in order to draw inferences. This most often involves planning experiments to ensure that valid answers to questions are obtained from the sample. Statistics is a subject that deals with the collection and analysis of data and affects most aspects of modern life.

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 **Module-1 (11h)**

**Review of Design of Experiment**

Review of Completely randomized Design (C.R.D), Randomized Block Design (R.B.D) and Latin Suare Design (L.S.D)

**Module-2 (12h)**

**Index Numbers**

**Missing Plot Technique :** Anaysis of Randomized Block Design (R.B.D) with one and two missing observations and Latin Square Design (L.S.D) with one missing observation.

 **Module-3** (**10h)**

 **Analysis of Covariance (ANCOVA):** Analysis of covariance for a one-way classification with one concomitant variable in C.R.D. Layout and for two-way classificaction with one concomitant variable in R.B.D

**Module-4** (**12h)**

**Factorial Design:** Estimation of main effects interactions and analysis of 22,23,32 factorial experiments

**List of Text Books:**

1. V.K.Kapoor and S.C.Gupta : Fundamentals of Applied Statistics. Sultan Chand

 **List of reference books:**

 1.Parimal Mukhopadhyay : Applied Statistics . New Central Book agency.

1. Daroga Singh and Chowdhary: Theory and Analysis of Sample survey designs.

Wiley Eastern.

1. M.R.Saluja : Indian Official Statistics. ISI publications.
2. B.L.Agarwal: Basic Statistics.New Age publications.
3. S.P.Gupta : Statistical Methods. Sultan Chand and Sons.
4. PratirupaSidhanthamulu – TeluguAcademy.
5. PrayogaRachana and Visleshana – TeluguAcademy.

**Paper –VIII-Cluster (A2): Advanced Designs of Experiment**

**Model blue print for the Question Paper setter**

**Max. marks:70 Time : 3 Hrs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Unit / Chapter name** | **Very Short Answer Questions** | **Short Answer Questions** | **Essay Questions** | **Marks allotted to the Unit/Chapter** |
| **Unit - 1** |
| **Review of CRD, RBD & LSD** | **1** | **2** | **2** | **31** |
| **Unit - 2** |
| **Missing plot technique** | **2** | **2** | **2** | **32** |
| **Unit - 3** |
| **Analysis of Covariance (ANCOVA)** | **1** | **2** | **2** | **31** |
| **Unit - 4** |
| **Factorial Design** | **1** | **2** |  **2** | **31** |
| **Any of the above Units (i.e., 1-4)** |
| - |  |  |  |  |
| **Total No. of Questions including choice (21)** | **5** | **8** | **8** |  |
| **Total marks allotted to all questions including choice =** | **125** |

**P.R.Government College (Autonomous), Kakinada**

**III year B.Sc., Degree Examinations- VI Semester**

**Statistics Paper-VIII Cluster (A2): Advanced Designs of Experiment**

 **(Model paper)**

**Time: 3 Hrs. Max. Marks: 70**

**Section –A**

**5X1 = 5 M**

**Answer all questions.**

1. Define CRD?.
2. Write the two applications of RBD?
3. Define missing plot ?
4. What is concomitant variable?.
5. What is main effect?.

 **Section – B**

**5x5 = 25 M**

**Answer any FIVE of the following questions. Each question carries FIVE marks.**

1. Explain principles of experimental design?.
2. Discuss advantages & disadvantages of RBD?.
3. Explain missing plot technique in Designs of Experiment?.
4. Derive single missing yield in RBD?
5. Explain analysis of covariance (ANCOVA)?
6. Construct lay out of ANCOVA in one way classification?
7. Explain interaction effect in factorial design?
8. Write advantages & disadvantages of factorial design?

**Section – C**

**Answer any two question 2x10 = 20 M**

1. Explain the analysis of CRD with ANOVA?
2. Explain concept and lay out of LSD ?
3. Explain in detail the analysis of two missing values in RBD? And also construct ANOVA tables after estimating the two missing values?
4. Derive single missing values in LSD also construct ANOVA tables after estimating the single value?

**Section – D**

**Answer any TWO questions. 2x10 = 20 M**

18. Derive one way classification in one concomitant variable in ANCOVA?

 19. Explain in brief ANCOVA in RBD with two concomitant variable?.

 20. How to estimate main effects in 22 factorial designs?

21. How to estimate interaction effects in 32 factorial experiments?

**P.R.Government College (Autonomous), Kakinada**

**III year B.Sc., Degree Examinations- VI Semester**

**Statistics Paper VIII Cluster B1: Operations Research-I**

**Time: 3 Hrs. Max. Marks: 70**

**Objective:** The central objective of operations research is [optimization](http://mathworld.wolfram.com/Optimization.html), i.e., "to do things best under the given circumstances." This general concept has great many applications, for instance, in agricultural planning, biotechnology, data analysis, distribution of goods and resources, emergency and rescue operations, engineering systems design, environmental management, financial planning, health care management, inventory control, manpower and resource allocation, manufacturing of goods, military operations, production process control, risk management, sequencing and scheduling of tasks, telecommunications, and traffic control.

**Module -1**

**Linear programming problem –advanced technique (12h)**

Introduction to revised simplex method

 Revised simplex method (RSM) algorithm

 Simplex method vs revised simplex method

 Bounded variables

 Bounded variable simplex method

**Module-2**

**Transportation Problem (12h)**

 Definition of transportation problem,

 TPP as a special case of LPP,

 Feasible solutions by NWCR, MM, VAM

Optimal solution through MODI

 Unbalanced transportation problem.

Degeneracy in TP and resolving it.

**Module-3 (14h)**

 **Assignment Problem**

Formulation and description of Balanced Assignment problem.

 Unbalanced assignment problem,

Traveling salesman problem.

Optimal solution using Hungarian method.

**Module –4** **(10h)**

**Sequencing**

Problem of Sequencing.

 Optimal sequence of N jobs on two and three machines without passing.

**List of text books:**

Operation Research by S.D.Sharma.

**Paper –VIII Cluster B1:Operations Research-I**

**Model blue print for the Question Paper setter**

**Max. marks:70 Time : 3 Hrs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Unit / Chapter name** | **Very Short Answer Questions** | **Short Answer Questions** | **Essay Questions** | **Marks allotted to the Unit/Chapter** |
| **Unit – 1** |
| **Lpp advanced techni que** | **1** | **2** | **2** | **31** |
| **Unit – 2** |
| **Transportation** | **1** | **2** | **2** | **31** |
| **Unit – 3** |
| **Assignment** | **1** | **2** |  **2** | **31** |
| **Unit-4** |
| **Sequencing** | **1** | **1** | **1** | **32** |
|  |  | **Any of the above Units (i.e., 1-4)** |
| - |  |  |  |  |
| **Total No. of Questions including choice (21)** | **5** | **8** | **8** |  |
| **Total marks allotted to all questions including choice =** | **125** |

**P.R. Government College (Autonomous), Kakinada**

**III year B.Sc., Degree Examinations-VI Semester**

**Statistics paper VIII Cluster B1**: **operation research-I**

**Time: 3 Hrs. Max. Marks: 70**

 **Section –A 5X1 = 5**

**Answer all questions.**

1. Define revised simplex.
2. Define unbalanced assignment problem.
3. Define optimal sequence.
4. Write procedure for penalties in transportation problem.
5. Define transportation.

**Section – B 5x5 = 25 M**

 **Answer any five of the following questions. Each question carries five marks.**

1. Explain the procedure of travelling sales man problem.
2. Explain the procedure of unbalanced assignment problem.
3. Define idle time & total elapsed time.
4. Explain two machines and n jobs for the sequencing problem.
5. Write advantages disadvantages of revised simplex method.
6. Write about bounded variables.
7. What is unbalanced transportation problem.
8. What is degeneracy in transportation problem.

 **Section – C 2x10 = 20 M**

 **Answer any two questions.**

1. solve the following LPP

minimize Z=6x1-2x2-3x3

subject to the constraints

2x1+4x2+2x3≤8

x1-2x2+3x3≤7

and 0≤x1≤2 , 0≤x2≤2 , 0≤x3≤1

1. write revised simplex method algorithm
2. Define a transportation problem and explain the problem of degeneracy. Explain a method of resolving it.
3. Describe the MODI method to solve a transportation problem. Obtain an optimum solution to the following transportation problem.

 **D E F availability**

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| 6 | 4 | 6 |
| 3 | 2 | 1 |
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**Section-D**

 **Answer any two questions. 2x5=10**

1. Explain the procedure of Hungarian method
2. Solve the following assignment problem

 Man/ job A B C D

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1 | 5 | 3 | 2 | 8 |
| 2 | 7 | 9 | 2 | 6 |
| 3 | 6 | 4 | 5 | 7 |
| 4 | 5 | 7 | 7 | 8 |

1. Write the Procedure to determine the sequence for performing the jobs to minimize total elapsed time T.
2. Determine the optimal sequence of jobs that minimizes total based on the following information processing time on machines is given in hours and passing is not allowed.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Job | A | B | C | D | E | F | G |
| Machine M1 | 3 | 8 | 7 | 4 | 9 | 8 | 7 |
| Machine M2 | 4 | 3 | 2 | 5 | 1 | 4 | 3 |
| MachineM3 | 6 | 7 | 5 | 11 | 5 | 6 | 12 |

**P.R.Government College (Autonomous), Kakinada**

**III year B.Sc., Degree Examinations- VI Semester**

**Statistics Paper VIII Cluster B2: Operations Research-II**

**Time: 3 Hrs. Max. Marks: 70**

**Objective:** The central objective of operations research is [optimization](http://mathworld.wolfram.com/Optimization.html), i.e., "to do things best under the given circumstances." This general concept has great many applications, for instance, in agricultural planning, biotechnology, data analysis, distribution of goods and resources, emergency and rescue operations, engineering systems design, environmental management, financial planning, health care management, inventory control, manpower and resource allocation, manufacturing of goods, military operations, production process control, risk management, sequencing and scheduling of tasks, telecommunications, and traffic control.

**Module -1**

**Game and strategies:**

Introduction, Two person zero sum game, Saddle point, Dominance property, 2xn,mx2 games , Graphical method.

**Module-2**

**Inventory control-I**

Types of inventories, Cost of inventories, Factors effecting inventory control, Concept of EOQ, Deterministic inventory models.

**Module-3**

**Inventory control-**II

Problems on EOQ with one price &more than one price break, Simple problems, probabilistic inventory model, Instantaneous demand, No setup cost model, News paper boy problem

**Module-4 (14h)**

**Net work scheduling**.

PERT, CPM , Logical sequencing ,Rules for net workconsruction, Critical path analysis ,Floats and slack times.

**List of text books:**

Operation Research by S.D.Sharma.

**Paper –VIII Cluster B2:Operations Research-II**

**Model blue print for the Question Paper setter**

**Max. marks:70 Time : 3 Hrs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Unit / Chapter name** | **Very Short Answer Questions** | **Short Answer Questions** | **Essay Questions** | **Marks allotted to the Unit/Chapter** |
| **Unit – 1** |
| **Game theorey** | **1** | **2** | **2** | **31** |
| **Unit – 2** |
| **Inventory models I** | **1** | **2** | **2** | **31** |
| **Unit – 3** |
| **Inventory models II** | **1** | **2** |  **2** | **31** |
| **Unit-4** |
| **Networking scheduling** | **1** | **1** | **1** | **32** |
|  |  | **Any of the above Units (i.e., 1-4)** |
| - |  |  |  |  |
| **Total No. of Questions including choice (21)** | **5** | **8** | **8** |  |
| **Total marks allotted to all questions including choice =** | **125** |

**P.R.Government College (Autonomous), Kakinada**

**III year B.Sc., Degree Examinations-VI Semester**

**Statistics VIII Cluster - B2**: **operation research-II**

**Time: 3 Hrs. Max. Marks: 70**

 **Section –A 5X1 = 5**

**Answer all questions.**

1. Define saddle point.
2. What is inventory?
3. What is average inventory?
4. Define pert.
5. Define CPM.

 **Section – B 5x5 = 25 M**

 **Answer any five of the following questions. Each question carries five marks.**

1. Explain the procedure of 2x2 rectangular game.
2. Explain pure and mixed stratagies.
3. Explain concept of inventory by trail and error method.
4. Explain concept of EOQ by graphical method.
5. Write about economic lot size with finate rate
6. Write about net working system.
7. Write basic steps in PERT technique
8. Write rules for drawing net work digram.

  **Section-C 2x10=20**

**Answer any two of the following:**

1. Find optimal strategies for the games for which for the pay off matrices are given below also find the value of the game.

|  |
| --- |
| P2 |
| P1 |  | I | II |
| I | 1 | 3 |
| II | 4 | 2 |

1. Write procedure of graphical method in 2X2 games.
2. How to develope an inventory model.
3. Explain concept of Economic order quantity.

**Section-D 2x10=20**

1. Write economic lot size with different rates of demand in different cycles.
2. Find EOQ for the following data

 *Annual usage=1,000 pages Expediting cost=RS.4 per order*

 *Cost per price =Rs.250 Inventory holing cost=20% of average inventory*

 *Ordering cost=RS.6per order material holding cost=Re 1 per price*

1. Explain forward pass computation&Back ward pass computations
2. Find the optimum time of completion of project ,when the time of completion of each task is as follows :

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Task | A | B | C | D | E | F | G | H | I |
| Time | 23 | 8 | 20 | 16 | 24 | 18 | 19 | 4 | 10 |

B.Sc. III Year: Statistics Syllabus

**Practical Paper –IV (Elective – I&II)**

## Statistical Quality Control

1. Construction of mean, range and standard deviation charts.

2. Construction of mean, range and standard deviation charts using MS Excel

3. Construction of p, np and c- charts with fixed and varying sample sizes.

4. Construction of p, np and c- charts with fixed and varying sample sizes using MSExcel**.**

5. Designing of Single sampling plan and Double sampling plan for attributes and

 construction of their OC and ASN curves

6.Designing of Single sampling plan and Double sampling plan for attributes and

construction of their OC and ASN curves using MS Excel**.**

**Reliability**

7. Computation of reliability for series, parallel and k out of n systems.

8. Computation of reliability for series, parallel and k out of n systems using MS Excel.

**Operations Research**

9. Formulation and graphical solutions of LPP (using different inequality type constraints)

10. Solution of LPP by simplex method.

11. Solution of LPP by simplex method using.

12. Solution of an LPP using Big-M and two phase simplex methods

13. Solution of an LPP using Big-M method and two phase simplex method .

14. Solution of an LPP using principal of duality and dual simplex methods.

15. Solution of an LPP using principal of duality and dual simplex methods.

16. Formulation and solution of transportation problem using North-West corner rule, Matrix

 minimum methods and VAM and to test their optimality.

17. Formulation and solution of transportation problem using North-West corner rule, Matrix

 minimum methods and VAM and to test their optimality.

18. Optimum solution to balanced and unbalanced transportation problems by MODI method (both maximization and minimization cases).

19. Formulation and solution of Assignment problem using Hungarian method (both

 maximization and minimization cases),

20. Formulation and solution of Assignment problem using Hungarian method (both

 maximization and minimization cases.

21. Solution of unbalanced Assignment problem.

22. Solution of traveling salesman problem.

23. Solution of sequencing problem—processing of n jobs through two machines and

 processing of n jobs through three machines.

24. Solution of PERT & CPM.

25. Solution of graphical method in game theory

26. Solution of dominance rule in game theory.

**Note**: Training shall be on establishing formulae in Excel cells and deriving the results. The excel output shall be exported to MSWord for writing inferences.

**Question paper pattern.** odd sem

**Theory:** Five Questions will be given.

 The Student has to answer three questions**. 3x12=36 M**

 **Record: 10M**

 **Viva: 4M**

**TOTAL: 50M**

Question paper pattern: even sem

**Theory:** Five Questions will be given.

 The Student has to answer three questions**. 3x12=36 M**

 **Record: 10M**

 **Viva: 4M**

**TOTAL: 50M**