Date : 27-07-2022

From :
Dr. P. Sreehari Reddy,
Lecturer in Mathematics & Chairman - B.O.S., V.S.U.,
Govt., Degree College,
NAIDUPET.

To :
The Registrar,
V.S. University,
Nellore - 524 003.

Sir,

Sub :- VSU, Nellore - BOS Mathematics Submission of Revised Syllabus - [U.G.] 5th Semester - Reg.

Ref :- RC.No.VSU/CDC/Modf.Proc./Const.of BOS/2022-23, Dated :19-07-2022.

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Under the subject and reference cited, this is to inform you that the board of studies meeting for Mathematics (U.G.) is being held on 24-07-2022. I am here with Submitting the syllabus in Mathematics [U.G.] for the 5th Semester. The syllabus provided by the A.P.S.C.H.E. was discussed in detail and the views of the members were obtained in Google meeting. The Revised Syllabus Model Question Paper and Blue print of the question paper along with Signatures of B.O.S. Members, are enclosed herewith for the Circulation among the Colleges under the Jurisdiction of V.S.U., Nellore.

Thanking you

Yours Faithfully,

[Dr. P. Sreehari Reddy]
Chairman-B.O.S.

Enclose :- *As stated above.*

Members :

Smt. D. Usha Rani, (Lecturer in Mathematics) SVSGC College – Sullurpet.

Dr. T. Venkateswarlu, (Lecturer in Mathematics) M.R.R. Degree College – Udayagiri.

Smt. T. Visalakshi, (Lecturer in Mathematics) Mathematics)Jawahar Bharathi Degree College – Kavali.

Smt. S. Kiranmaiye, (Lecturer in S.K.R. Govt., Degree College – Gudur.

Dr. B. Suseelavathy, (Lecturer in Mathematics)Govt., Degree College – Naidupet.

VIKRAMA SIMHAPURI UNIVERSITY :: S.P.S.R.NELLORE

(A Statutory body of the Government of Andhra Pradesh) REVISED UG SYLLABUS UNDER CBCS
(Implemented from Academic Year - 2020-21) PROGRAMME: FOUR YEAR B.A. /B.Sc. (Hons)

Domain Subject: MATHEMATICS

Skill Enhancement Courses (SECs) for Semester V, from 2022-23 *(Syllabus with Learning Outcomes, References, Co-curricular Activities & Model Q.P. Pattern)*

Structure of SECs for Semester–V

(To choose One pair from the Four alternate pairs of SECs)

Unit CODE	Course Number 6&7	Name of Course	HOURS	CREDITS	Marks	
					IA–20 Filed Work 05	Sem End
	6A	Numerical Methods	**6**	**5**	**25**	**75**
	7A	Mathematical Special Functions	**6**	**5**	**25**	**75**

OR

	6B	Multiple integrals and Applications of Vector Calculus	**6**	**5**	**25**	**75**
	7B	Integral transforms with Applications	**6**	**5**	**25**	**75**

OR

	6C	Partial Differential Equations and Fourier Series	**6**	**5**	**25**	**75**
	7C	Number theory	**6**	**5**	**25**	**75**

OR

Note : The students who are studying statistics as one of the group subjects should not select 6(D) & 7(D).

	6D	Data Analytics methods & Probability	**6**	**5**	**25**	**75**
	7D	Optimization techniques	**6**	**5**	**25**	**75**

Note-1*: For Semester–V, for the domain subject Mathematics, any one of the three pairs of SECs shall be chosen as courses 6 and 7, i.e., (6A & 7A) or (6B & 7B) or (6C & 7C) or(6D & 7D),,the pair shall not be broken. A, B, C and D allotment is random, not on any priority basis.*

Note-2*: One of the main objectives of Skill Enhancement Courses (SEC) is to inculcate skills related to the domain subject in students. The syllabus of SEC will be partially skill oriented. Hence, teachers shall also impart practical training to students on the skills embedded in the syllabus citing related real field situations.*

P. Sreenivasa Reddy D. Usha Rani T. Venkateswarlu

VIKRAMA SIMHAPURI UNIVERSITY :: S.P.S.R.NELLORE

Semester-wise Revised Syllabus under CBCS, 2020-21

Four-year B.A. /B.Sc. (Hons) Domain Subject: **MATHEMATICS**

IV Year B.A./B.Sc.(Hons)– Semester – V

COURSE-6(A): NUMERICAL METHODS

(Skill Enhancement Course (Elective), 5 credits)

Max Marks: 100

I. LEARNING OUTCOMES:

Students after successful completion of the course will be able to

1. Understand the subject of various numerical methods that are used to obtain approximate solutions
2. Understand various finite difference concepts and interpolation methods.
3. Work out numerical differentiation and integration whenever and wherever routine methods are not applicable.
4. Find numerical solutions of ordinary differential equations by using various numerical methods.
5. Analyze and evaluate the accuracy of numerical methods.

II. SYLLABUS : (Hours: Teaching: 75 (incl. unit tests etc. 05), Training: 15)

UNIT – 1 : Finite Differences and Interpolation with Equal intervals (15h)

1. Introduction, Forward differences, Backward differences, Central Differences, Symbolic relations, nth Differences of Some functions,
2. Advancing Difference formula, Differences of Factorial Polynomial, Summation of Series.
3. Newton‟s formulae for interpolation. Central Difference Interpolation Formulae.

UNIT – 2 : Interpolation with Equal and Unequal intervals **(**15h)

1. Gauss‟s Forward interpolation formulae, Gauss‟s backward interpolation formulae, Stirling‟s formula, Bessel‟s formula.
2. Interpolation with unevenly spaced points, divided differences and properties, Newton‟s divided differences formula.
3. Lagrange‟s interpolation formula, Lagrange‟s Inverse interpolation formula.

UNIT – 3 : Numerical Differentiation (15h)

1. Derivatives using Newton‟s forward difference formula, Newton‟s back ward difference formula,
2. Derivatives using central difference formula, Stirling‟s interpolation formula,
3. Newton‟s divided difference formula

UNIT – 4 : Numerical Integration (15h)

1. General quadrature formula one errors, Trapezoidal rule,
2. Simpson‟s1/3– rule, Simpson‟s 3/8 – rule

UNIT – 5 : Numerical solution of ordinary differential equations **(15h)**

1. Introduction, Solution by Taylor‟s Series,
2. Runge - Kutta Methods,
3. Euler‟s method.

III. References:

1. S.S.Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India Pvt. Ltd., New Delhi-110001, 2006.
2. P.Kandasamy, K.Thilagavathy, Calculus of Finite Differences and Numerical Analysis.
S. Chand & Company, Pvt. Ltd., Ram Nagar, New Delhi-110055.
3. R.Gupta, Numerical Analysis, Laxmi Publications (P) Ltd., New Delhi.
4. H.C Saxena, Finite Differences and Numerical Analysis, S. Chand & Company Pvt. Ltd., Ram Nagar, New Delhi-110055.
5. S.Ranganatham, Dr.M.V.S.S.N.Prasad, Dr.V.Ramesh Babu, Numerical Analysis,
S. Chand & Company Pvt. Ltd., Ram Nagar, New Delhi-110055.
6. Web resources suggested by the teacher and college librarian including reading material.

IV. Co-Curricular Activities:

A) Mandatory:

1. For Teacher: Teacher shall train students in the following skills for 15 hours, by taking relevant outside data (Field/Web).

1. Applications of Newton‟s forward and back ward difference formulae.
2. Applications of Gauss forward and Gauss back ward, Stirling‟s and Bessel‟s formulae.
3. Applications of Newton‟s divided differences formula and Lagrange‟s interpolation formula.
4. Various methods to find the approximation of a definite integral.
5. Different methods to find solutions of Ordinary Differential Equations.

2. For Student: Fieldwork/Project work; Each student individually shall undertake Fieldwork/Project work and submit a report not exceeding 10 pages in the given format on the work- done in the areas like the following**,** by choosing any one of the aspects.

1. Collecting the data from the identified sources like Census department or Electricity department, by applying the Newton‟s, Gauss and Lagrange‟s interpolation formula, making observations and drawing conclusions. (Or)

2. Selection of some region to find the area by applying Trapezoidal rule, Simpson‟s1/3– rule, Simpson‟s 3/8 – rule, and Weddle‟s rules. Comparing the solutions with analytical solution and concluding which one is the best method. (Or)

3. Finding solution of the ODE by Taylor‟s Series, Picard‟s method of successive approximations, Euler‟s method, Modified Euler‟s method, Runge–Kutta methods. Comparing the solutions with analytical solution, selecting the best method.

3. Max. Marks for Fieldwork/Project work Report: 05.

4. Suggested Format for Fieldwork/Project work Report: Title page, Student Details, Index page, Stepwise work-done, Findings, Conclusions and Acknowledgements.

V. Unit tests (IE).

b) Suggested Co-Curricular Activities:

1. Assignments/collection of data, Seminar, Quiz, Group discussions/Debates
2. Visits to research organizations, Statistical Cells, Universities, ISI etc.
3. Invited lectures and presentations on related topics by experts in the specified area.

P. Srinivasa Reddy D. Usha Rani T. Venkateswarlu

T. Veeraiah

V. Suggested Question Paper Pattern:

Max.Marks:75 **Time:3 hrs**

SECTION - A (Total: 5 X 5=25Marks)

(Answer any **FIVE questions**. Each answer carries **5 Marks)**

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SECTION - B (Total: 5 X 10=50Marks)

(Answer any **FIVE questions**. Each answer carries **10 Marks)**

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NOTE* :- *Paper Setter Must select TWO Short Questions and TWO Easy Questions from Each Unit

P. Srinivas Reddy D. Usha Rani T. Venkateswarlu

VIKRAMA SIMHAPURI UNIVERSITY :: S.P.S.R.NELLORE

Semester-wise Revised Syllabus under CBCS, 2020-21

Four-year B.A. /B.Sc. (Hons) Domain Subject: **MATHEMATICS**

IV Year B.A./B.Sc.(Hons)– Semester – V

COURSE-7(A): MATHEMATICAL SPECIAL FUNCTIONS

(Skill Enhancement Course (Elective), 5 credits)

Max Marks: 100

I. LEARNING OUTCOMES:

Students after successful completion of the course will be able to:

1. Understand the Beta and Gamma functions, their properties and relation between these two functions, understand the orthogonal properties of Chebyshev polynomials and recurrence relations.

2. Find power series solutions of ordinary differential equations.

3. solve Hermite equation and write the Hermite Polynomial of order (degree) n, also find the generating function for Hermite Polynomials, study the orthogonal properties of Hermite Polynomials and recurrence relations.

4. Solve Legendre equation and write the Legendre equation of first kind, also find the generating function for Legendre Polynomials, understand the orthogonal properties of Legendre Polynomials.

5. Solve Bessel equation and write the Bessel equation of first kind of order n, also find the generating function for Bessel function understand the orthogonal properties of Bessel unction.

II. SYLLABUS: (Hours: Teaching: 75 (incl. unit tests etc. 05), Training: 15)

UNIT – 1 : Beta and Gamma functions, Chebyshev polynomials *(15h)*

1. Euler‟s Integrals-Beta and Gamma Functions, Elementary properties of Gamma Functions, Transformation of Gamma Functions.

2. Another form of Beta Function, Relation between Beta and Gamma Functions.

3. Chebyshev polynomials, orthogonal properties of Chebyshev polynomials

UNIT – 2 : Power series and Power series solutions of ordinary differential equations *(15h)*

1. Introduction, summary of useful results, power series, radius of convergence, theorems on Power series

2. Introduction of power series solutions of ordinary differential equation

UNIT – 3 : Hermite polynomials *(15h)*

1. Hermite Differential Equations, Solution of Hermite Equation, Hermite polynomials, generating function for Hermite polynomials.

2. Other forms for Hermite Polynomials, Rodrigues formula for Hermite Polynomials, to find first few Hermite Polynomials.

3. Orthogonal properties of Hermite Polynomials, Recurrence formulae for Hermite Polynomials.

UNIT – 4 : Legendre polynomials *(15h)*

1. Definition, Solution of Legendre‟s equation, Legendre polynomial of degree n, generating function of Legendre polynomials.

2. Definition of $P_n(x)$ and $Q_n(x)$, General solution of Legendre‟s Equation (derivations not required) to show that Pn (x) is the coefficient of h^n, in the expansion of $(1-2xh+h^2)^{-\frac{1}{2}}$ Orthogonal properties of Legendre‟s polynomials, Recurrence formulas for Legendre‟s Polynomials.

UNIT – 5 : Bessel's equation *(15h)*

1. Definition, Solution of Bessel‟s equation, Bessel‟s function of the first kind of order n, Bessel‟s function of the second kind of order n.

2. Integration of Bessel‟s equation in series form=0, Definitionof $J_n(x)$, recurrence for mulae for $J_n(x)$.

3. Generating function for $J_n(x)$, orthogonally of Bessel functions.

III. Reference Books:

1. Dr.M.D.Raisinghania, Ordinary and Partial Differential Equations, S. Chand & Company Pvt. Ltd., Ram Nagar, New Delhi-110055.

2. J.N.Sharma and Dr.R.K.Gupta, Differential equations with special functions, Krishna Prakashan Mandir.

3. Shanti Narayan and Dr.P.K.Mittal, Integral Calculus, S. Chand & Company Pvt. Ltd., Ram Nagar, New Delhi-110055.

4. George F.Simmons, Differential Equations with Applications and Historical Notes, Tata McGRAW-Hill Edition, 1994.

5. Shepley L.Ross, Differential equations, Second Edition, John Willy & sons, New York, 1974.

6. Web resources suggested by the teacher and college librarian including reading material.

IV. Co-Curricular Activities:

A) Mandatory:

1. For Teacher: Teacher shall train students in the following skills for 15 hours, by taking relevant outside data (Field/Web).

1. Beta and Gamma functions, Chebyshev polynomials.

2. Power series, power series solutions of ordinary differential equations,

3. Procedures of finding series solutions of Hermite equation, Legendre equation and Bessel equation.

4. Procedures of finding generating functions for Hermite polynomials, Legendre Polynomials and Bessel‟s function.

2. For Student: Fieldwork/Project work; Each student individually shall undertake Fieldwork/Project work, make observations and conclusions and submit a report not exceeding 10 pages in the given format on the work-done in the areas like the following**,** by choosing any one of the aspects.

1. Going through the web sources like Open Educational Resources on the properties of Beta and Gamma functions, Chebyshev polynomials, power series solutions of ordinary differential equations. (or)

2. Going through the web sources like Open Educational Resources on the properties of series solutions of Hermite equation, Legendre equation and Bessel equation.

3. Max. Marks for Fieldwork/Project work Report: 05.

4. Suggested Format for Fieldwork/Project work Report: Title page, Student Details, Index page, Stepwise work-done, Findings, Conclusions and Acknowledgements.

5. Unit tests (IE).

b) Suggested Co-Curricular Activities:

1. Assignments/collection of data, Seminar, Quiz, Group discussions/Debates

2. Visits to research organizations, Statistical Cells, Universities, ISI etc.

3. Invited lectures and presentations on related topics by experts in the specified area.

P. Srinivasa Reddy D. Usha Rani T. Venkateswarlu

T. Veeraiah

V. Suggested Question Paper Pattern:

Max.Marks:75 **Time:3 hrs**

SECTION - A (Total: 5 X 5=25Marks)

(Answer any **FIVE questions**. Each answer carries **5 Marks)**

1.

2.

3.

4.

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10.

SECTION - B (Total: 5 X 10=50Marks)

(Answer any **FIVE questions**. Each answer carries **10 Marks)**

11.

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***NOTE* :- Paper Setter Must select *TWO* Short Questions and *TWO* Easy Questions from Each Unit**

P. Sreenivasa Reddy D. Usha Rani T. Venkateswarlu

VIKRAMA SIMHAPURI UNIVERSITY :: S.P.S.R.NELLORE

Semester-wise Revised Syllabus under CBCS, 2020-21

Four-year B.A. /B.Sc. (Hons) Domain Subject: **MATHEMATICS**

IV Year B.A./B.Sc.(Hons)– Semester – V

COURSE-6(B): MULTIPLE INTEGRALS AND APPLICATIONS OF VECTOR CALCULUS

(Skill Enhancement Course (Elective), 5 credits)

Max Marks: 100

I. Learning Outcomes:

Students after successful completion of the course will be able to

1. Learn multiple integrals as a natural extension of definite integral to a function of two variables in the case of double integral / three variables in the case of triple integral.
2. Learn applications in terms of finding surface area by double integral and volume by triple integral.
3. Determine the gradient, divergence and curl of a vector and vector identities.
4. Evaluate line, surface and volume integrals.
5. understand relation between surface and volume integrals (Gauss divergence theorem), relation between line integral and volume integral (Green‟s theorem), relation between line and surface integral (Stokes theorem)

II. SYLLABUS: (Hours: Teaching: 75 (incl. unit tests etc.05), Training: 15)

UNIT – 1: Multiple integrals-I & *Vector Differentiation – I* (15h)

Introduction, Double integrals, triple integrals, evaluation of double integrals, evaluation of triple integrals (No question set to be from this portion).

Vector Function of Scalar Variable continuity of a vector function partial differentiation scalar point Faction vector point faction – Gradient of a scalar point Function – Unit normal – Directional Derivative at a Point – Angle between two surfaces.

UNIT – 2 : *Vector Differentiation – II* : **(15h)**

Vector differential Operator – Scalar Differential Operator – Divergence of a vector – Solenoidal vector – Laplacian operator – curl of a vector – Irrotational Vector – Vector identities.

UNIT – 3 : *Vector Integration - I :-* **(15h)**

Definition – Integration of a vector – simple problems – smooth curve – Line integral – Tangential Integral – circulation Problems on line Integral. Surface Integral – Flux Problems on Surface Integral.

UNIT – 4 : *Vector Integration - II :-* **(15h)**

Volume Integrals – Gauss Divergence Theorem statement and proof – Applications of Gauss Divergence theorem.

UNIT – 5 : *Vector Integration - III :-* **(15h)**

Green‟s Theorem in a plane Statement and proof – Application of Green‟s Theorem. Statement and Proof of Stoke Theorem – Application of stoke Theorem.

III. Reference Books:

1. Dr.M Anitha, Linear Algebra and Vector Calculus for Engineer, Spectrum University Press, SR Nagar, Hyderabad-500038, INDIA.

2. Dr.M.Babu Prasad, Dr.K.Krishna Rao, D.Srinivasulu, Y.AdiNarayana, Engineering Mathematics-II, Spectrum University Press, SR Nagar, Hyderabad-500038,INDIA.

3. V.Venkateswararao, N. Krishnamurthy, B.V.S.S.Sarma and S.Anjaneya Sastry, A text Book of B.Sc., Mathematics Volume-III, S. Chand & Company, Pvt. Ltd., Ram Nagar,NewDelhi-110055.

4. R.Gupta,Vector Calculus, Laxmi Publications.

5. P.C.Matthews, Vector Calculus, Springer Verlag publications.

6. Web resources suggested by the teacher and college librarian including reading material.

IV. Co-Curricular Activities:

A) Mandatory:

1. For Teacher: Teacher shall train students in the following skills for 15 hours, by taking Relevant outside data (Field/Web).

1. The methods of evaluating double integrals and triple integrals in the class room and train to evaluate. These integrals of different functions over different regions.

2. Applications of line integral, surface integral and volume integral.

3. Applications of Gauss divergence theorem, Green‟s theorem and Stokes‟s theorem.

2. For Student: Fieldwork/Project work Each student individually shall undertake Fieldwork/Project work and submit a report not exceeding 10 pages in the given format on the work-done in the areas like the following**,** by choosing any one of the following aspects.

1. Going through the web sources like Open Educational Resources to find the values of double and triple integrals of specific functions in a given region and make conclusions. (or)

2. Going through the web sources like Open Educational Resources to evaluate line integral, surface integral and volume integral and apply Gauss divergence theorem, Green‟s theorem and Stokes theorem and make conclusions.

3. Max. Marks for Fieldwork/Project work Report: 05.

4. Suggested Format for Fieldwork/Project work Report: Title page, Student Details, Index page, Stepwise work-done, Findings, Conclusions and Acknowledgements.

5. Unit tests (IE).

Suggested Co-Curricular Activities:

1. Assignments/collection of data, Seminar, Quiz, Group discussions/Debates

2. Visits to research organizations, Statistical Cells, Universities, ISI etc.

3. Invited lectures and presentations on related topics by experts in the specified are

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T. Venkateswarlu

BLUE PRINT OF MULTIPLE INTEGRALS AND APPLICATIONS OF VECTOR CALCULUS

(INSTRUCTIONS TO PAPER SETTER) B.A / B.Sc MATHEMATICS

NOTE* :- *Paper Setter Must select TWO Short Questions and TWO Easy Questions from Each Unit as Follows

UNIT	TOPICS	5 MARKS QUESTIONS	10 MARKS QUESTIONS
UNIT - I	Introduction, Gradient	2 (Problems)	-
	Unit Normal, Directional Derivates Angle Between two Surfaces	-	2 (Problems)
UNIT - II	Divergence of a vector, Curl of a vector, Solenoidal vector, Irrotational Vector.	2 (Problems)	-
	Laplace Operator	-	1 (Problem)
	Vector Identities	-	1 (Theorem)
UNIT -III	Integration of a Vector	1 (Problem)	-
	Line Integral	1 (Problem)	1 (Problem)
	Surface Integral	-	1 (Problem)
UNIT -IV	Volume Integral	1 (Problem)	-
	Gauss Divergence Theorem	1 (Problem)	1 (Theorem) 1 (Problem)
UNIT - V	Green's Theorem + Stoke Theorem	1 (Theorem) 1 (Problem)	1 (Theorem) 1 (Problem)

P. Srinivasa Reddy
T. Venkateswarlu

D. Usha Rani
T. Venkateswarlu

VIKRAMA SIMHAPURI UNIVERSITY :: NELLORE.

B.A./B.Sc. THIRD YEAR MATHEMATICS

SEMESTER - V, PAPER - 6(B)

6(B)-MULTIPLE INTEGRALS AND APPLICATIONS OF VECTOR CALCULUS

TIME : 3 HOURS **MAX.MARKS : 75**

PART-A

I. Answer any FIVE Questions : ***5 X 5 = 25M***

1. Prove that $\nabla(\log r) = \frac{\bar{r}}{r^2}$.

2. Find grad f at $(1,1,-2)$ when $f = x^3 + y^3 + 3xyz$.

3. If $\vec{f} = xy^2 i + 2x^2 yzj + 3yz^2 k$ find curl $\vec{f}$ at (1,-1,1).

4. Define solenoidal vector show that $3y^4 3^2 i + 4x^3 z^3 j + 3x^2 y^2 k$ is solenoidal.

5. If $\vec{F}(t) = \left(t - t^2\right) i + 2t^3 j - 3\bar{k}$ find $\int_1^2 \vec{F}(t)\, dt$.

6. Evaluate $\int_c F.dr$ where $F = 3x^2 i + (2xz - y)\, j + zk$ along the straight line C from $(0,0,0)$ to $(2,1,3)$.

7. If $F = 2xzi - xj + y^2 k$ evaluate $\int_V F.dV$ where v is the region bounded by the surfaces $x = 0,\ x = 2,\ y = 0,\ y = 6,\ z = x^2,\ z = 4$.

8. Show that by Gauss Divergence Theorem $\int_s (axi + byj + czk).NdS = 4\frac{\pi}{3}(a + b + c)$ where S is the surface of the sphere $x^2 + y^2 + z^2 = 1$.

9. State Green"s theorem.

10. Evaluate by stoke theorem $\int_s \vec{F}.d\bar{r}$ when $\vec{F} = yzi + 3xj + xyk$ and C is the curve $x^2 + y^2 = 1, z = y^2$.

PART - B

II. Answer any FIVE of the following Questions. (5 X 10 = 50 Marks)

11. If $a = x + y + z, b = x^2 + y^2 + z^2, c = xy + yz + 3x$ prove that $[\nabla a, \nabla b, \nabla c] = 0$.

12. Find the Directional derivative of $f = xy + yz + zx$ in the direction of the vector $i + 2j + 2k$ at $(1, 2, 0)$.

13. Prove that $div\left(\bar{A} \times \bar{B}\right) = \bar{B}\ curl\,\bar{A} - \bar{A}\,curl\,\bar{B}$.

14. Prove that $\nabla^2\left(\frac{1}{r3}\right) = 0$.

15. If $\vec{F} = 3xyi - y^2 j$ evaluate $\int_c F, d\bar{r}$ when C is the curve $y = 2x^2$ in xy plane from $(0,0)$ to $(1,2)$.

16. If $\vec{F} = 2yi - 3j + x^2 k$ and S is the surface $y^2 = 8x$ in the front octant bounded by the planes $y = 4$ and $z = 6$. Evaluate $\int_s \vec{F}.\vec{n}\ ds$.

17. State and prove Gauss"s Divergence theorem.

18. Verify divergence theorem for $F = 4xyi - y^2 j + yzk$ taken over, the curve bounded by $x = 0,\ x = 1,\ y = 0,\ y = 1,\ z = 0,\ z = 1$.

19. Evaluate by Green"s Theorem.

$\int_c \left(3x^2 - 8y^2\right)dx\left(4y - 6xy\right)dy$ when C is the boundary defiled by $x = 0, y = 0, x + y = 1$.

20. State and prove stoke"s Theorem.

NOTE :- Paper Setter Must select TWO Short Questions and TWO Easy Questions from Each Unit

P. Srinivasa Reddy
T. Venkateswarlu

D. Usha Rani

T. Venkateswarlu

VIKRAMA SIMHAPURI UNIVERSITY :: S.P.S.R.NELLORE

Semester-wise Revised Syllabus under CBCS, 2020-21

Four-year B.A. /B.Sc. (Hons)DomainSubject: **MATHEMATICS**

IV Year B.A./B.Sc.(Hons)– Semester – V

COURSE-7(B): INTEGRAL TRANSFORMS WITH APPLICATIONS

(Skill Enhancement Course (Elective), 5 credits)

Max Marks: 100

I. LEARNING OUTCOMES:

Students after successful completion of the course will be able to

1. Evaluate Laplace transforms of certain functions, find Laplace transforms of derivatives and of integrals.

2. Determine properties of Laplace transform which may be solved by application of special functions namely Dirac delta function, error function, Bessel function and periodic function.

3. Understand properties of inverse Laplace transforms, find inverse Laplace transforms of derivatives and of integrals.

4. Solve ordinary differential equations with constant/ variable coefficients by using Laplace transform method.

5. Comprehend the properties of Fourier transforms and solve problems related to finite Fourier transforms.

II. SYLLABUS :(Hours: Teaching: 75 (incl. unit tests etc.05), Training: 15)

UNIT – 1: LAPLACE TRANSFORMS- I (15h)

1. Definition of Laplace transform, linearity property-piecewise continuous function.

2. Existence of Laplace transform, functions of exponential order and of class A.

3. First shifting theorem, second shifting theorem and change of scale property.

UNIT – 2: LAPLACE TRANSFORMS- II (15h)

1. Laplace Transform of the derivatives, initial value theorem and final value theorem. Laplace transforms of integrals.

2. Laplace transform of t^n. f (t), division by t, evolution of integrals by Laplace transforms.

UNIT – 3: INVERSE LAPLACE TRANSFORMS (15h)

1. Definition of Inverse Laplace transform, linear property, first shifting theorem, second shifting theorem, change of scale property, use of partial fractions**.**

2. Inverse Laplace transforms of derivatives, Inverse Laplace Transforms of integrals, multiplication by powers of „p‟, division by „p‟.

3. Convolution Theorem proof and applications.

UNIT – 4: APPLICATIONS OF LAPLACE TRANSFORMS & FOURIER TRANSFORM-I (15h)

1. Applications of Laplace transforms to integral equations.

2. Integral transforms, Fourier integral theorem (without proof), Fourier sine and cosine integrals, Properties of Fourier transforms, Linear property, change of scale property on Fourier transform, change of scale property on Fourier sine transform, change of scale property on Fourier cosine transform,

UNIT – 5: FOURIER TRANSFORMS-II (15h)

1. Shifting property, modulation theorem.

2. Relationship between Fourier transform and Laplace transform, Convolution theorem for Fourier transform, Problems on Integral equations ,Parseval‟s Identify.

III. Reference Books:

1. Dr. S.Sreenadh, S.Ranganatham, Dr.M.V.S.S.N.Prasad, Dr. V.Ramesh Babu, Fourier series and Integral Transforms, S. Chand & Company, Pvt. Ltd., Ram Nagar, New Delhi-110055.

2. A.R. Vasistha, Dr. R.K. Gupta, Laplace Transforms, Krishna Prakashan Media Pvt. Ltd. Meerut.

3. M.D.Raisinghania, H.C. Saxsena , H.K. Dass, Integral Transforms, S. Chand & Company Pvt. Ltd., Ram Nagar, New Delhi-110055.

4. Dr. J.K. Goyal, K.P. Gupta, Laplace and Fourier Transforms, Pragathi Prakashan, Meerut.

5. Shanthi Narayana , P.K. Mittal, A Course of Mathematical Analysis, S. Chand & Company Pvt.Ltd. Ram Nagar, New Delhi-110055.

6. Web resources suggested by the teacher and college librarian including reading material.

IV. Co-Curricular Activities:

A) <u>MANDATORY:</u>

1. For Teacher: Teacher shall train students in the following skills for 15 hours, by taking Relevant outside data (Field/Web).

1. Demonstrate on sufficient conditions for the existence of the Laplace transform of a function.
2. Evaluation of Laplace transforms and methods of finding Laplace transforms.
3. Evaluations of Inverse Laplace transforms and methods of finding Inverse Laplace transforms.
4. Fourier transforms and solutions of integral equations.

2. For Student: Fieldwork/Project work; Each student individually shall undertake Fieldwork/Project work and submit a report not exceeding 10 pages in the given format on the work-done in the areas like the following**,** by choosing any one of the aspects.

1. Going through the web sources like Open Educational Resources on Applications of convolution theorem to solve integral equations and make conclusions. (or)
2. Going through the web source like Open Educational Resources on Applications of Fourier transforms to solve integral equations and make conclusions.

3. Max. Marks for Fieldwork/Project work Report: 05.

4. **Suggested Format for Fieldwork/Project work Report**: Title page, Student Details, Index page, Stepwise work-done, Findings, Conclusions and Acknowledgements.

5. Unit tests (IE).

B) <u>SUGGESTED CO-CURRICULAR ACTIVITIES :</u>

1. Assignments/collection of data, Seminar, Quiz, Group discussions/Debates
2. Visits to research organizations, Statistical Cells, Universities, ISI etc.
3. Invited lectures and presentations on related topics by experts in the specified area.

P. [illegible] D. Usha Rani T. Venkateswarlu

T. [illegible]

BLUE PRINT OF INTEGRAL TRANSFORMS WITH APPLICATIONS

(INSTRUCTIONS TO PAPER SETTER)
B.A / B.Sc MATHEMATICS

***NOTE* :- Paper Setter Must select *TWO* Short Questions and *TWO* Easy Questions from Each Unit as Follows :-**

UNIT	TOPICS	5 MARKS QUESTIONS	10 MARKS QUESTIONS
UNIT - I	Laplace Transforms- I	1(Problem) 1(Theorem)	1(Problem) 1(Theorem)
UNIT - II	Laplace Transforms- II	1(Problem) 1(Theorem)	1(Problem) 1(Theorem)
UNIT -III	Inverse Laplace Transforms	1(Problem) 1(Theorem)	1(Problem) 1(Theorem)
UNIT - IV	Applications of Laplace Transforms & Fourier Transform-I	2 (Problems)	1 (Theorem) 1 (Problem)
UNIT - V	Fourier Transforms-II	1 (Theorem) 1 (Problem)	2(Theorems)

P. Srinivasa Reddy
T. Venkateswarlu
D. Usha Rani
T. Venkateswarlu

VIKRAMA SIMHAPURI UNIVERSITY :: NELLORE.

B.A./B.Sc. THIRD YEAR MATHEMATICS

SEMESTER - V, PAPER - 7(B)

7(B)-INTEGRAL TRANSFORMS WITH APPLICATIONS

TIME : 3 HOURS **MAX.MARKS : 75**

SECTION-A

I. Answer any FIVE. Each question carries Equal marks. ***5 X 5 = 25 M***

1. State and prove linear property for Laplace transforms.
2. Find $L\left\{3t^4 - 2t^3 + 4e^{-2t} - 2\sin 5t\right\}$
3. If $F(t)$ is a function of class A and if $L\{F(t)\} = f(p)$ then prove that $L\{t(F(t)\} = -f^{-1}(p)$.
4. Find $L\left\{t^2 \sin at\right\}$.
5. State and prove first shifting theorem in inverse Laplace transform.
6. Find $L^{-1}\left\{\dfrac{3p-2}{p^2-4p+20}\right\}$.
7. Define Abel"s integral equation and give one example.
8. Find the cosine transform of the function $f(x)$ if $f(x) = \begin{cases} \cos x, & 0 < x < a \\ 0, & x > a \end{cases}$
9. State and prove modulation theorem.
10. Solve $\int_0^\infty f(x)\cos\lambda x\,dx = e^{-\lambda}$.

SECTION-B

II. Answer any FIVE. Each question carries Equal marks. ***5 X 10 = 50 M***

11. State and prove second shifting theorem in Laplace transform.
12. Find $L\left\{e^{-2t}(3\cos 6t - 5\sin 6t)\right\}$
13. State and prove Intial value theorem.
14. Show that $\int_0^\infty t\,e^{-et}\cos t\,dt = \dfrac{3}{25}$
15. State and prove change of scale property in inverse Laplace transform.
16. Use the convolution theorem find $L^{-1}\left\{\dfrac{1}{(p-2)(p^2+1)}\right\}$
17. State and prove change of scale property for Fourier sine transform.
18. Solve the integral equation $F(t) = e^{-t} - 2\int_0^t \cos(t-u)F(u)du$.
19. State the prove Relationship between Fourier transform and Laplace transform.
20. State and prove Parseval"s Identify.

NOTE :- Paper Setter Must select TWO Short Questions and TWO Easy Questions from Each Unit

P. Sreenivasulu D. Usha Rani T. Venkateswarlu

T. Vasudeva

VIKRAMA SIMHAPURI UNIVERSITY :: S.P.S.R.NELLORE

Semester-wise Revised Syllabus under CBCS, 2020-21
Four-year B.A. /B.Sc. (Hons) Domain Subject: **MATHEMATICS**
IV Year B.A./B.Sc.(Hons)– Semester – V

COURSE-6(C): PARTIAL DIFFERENTIAL EQUATIONS & FOURIER SERIES

(Skill Enhancement Course (Elective), 5 credits)

Max Marks: 100

1. Learning Outcomes:

Students after successful completion of the course will be able to

1. Classify partial differential equations, formation of partial differential equations and solve Cauchy‟s problem for first order equations.
2. Solve Lagrange's equations by various methods, find integral Surface passing through a given curve and Surfaces orthogonal to a given system of Surfaces.
3. Find solutions of nonlinear partial differential equations of order one by using Char pit‟s method.
4. Find solutions of nonlinear partial differential equations of order one by using Jacobi's method.
5. Understand Fourier series expansion of a function f(x) and Parseval‟s theorem.

II. SYLLABUS: (Hours: Teaching: 75 (incl. unit tests etc.05), Training: 15)

UNIT – 1: INTRODUCTION OF PARTIAL DIFFERENTIAL EQUATIONS (15h)

1. Partial Differential Equations, classification of first order partial differential equations, Rule I, derivation of a partial differential equations by the elimination of arbitrary constants

2. Rule II, derivation of a partial differential equation by the elimination of arbitrary function φ from the equations $\emptyset(u, v) = 0$ where u and v are functions of x, y and z.

3. Cauchy‟s problem for first order equations

UNIT – 2: LINEAR PARTIAL DIFFERENTIAL EQUATIONS OF ORDER ONE (15h)

1. Lagrange's equations, Lagrange's method of solving Pp+Qq=R, where P, Q and R are functions of x, y and z, type 1 based on Rule I for solving dx/P=dy/Q=dz/R,
type 2 based on Rule II for solving dx/P=dy/Q=dz/R

2. Type 3 based on Rule III for solving dx/P=dy/Q=dz/R type 4 based on Rule IV for solving dx/P=dy/Q=dz/R

UNIT – 3: NON-LINEAR PARTIAL DIFFERENTIAL EQUATIONS OF ORDER ONE-I (15h)

1. Complete integral, particular integral, singular integral and general integral, geometrical interpretation of integrals of f (x, y, z, p, q) = 0, method of getting singular integral from the PDE of first order, compatible system of first order equations.

2. Char pit‟s method.

UNIT – 4: NON-LINEAR PARTIAL DIFFERENTIAL EQUATIONS OF ORDER ONE-II (15h)

1. Jacobi's method, Jacobi's method for solving partial differential equations with three or more independent variables, Jacobi's method for solving a non-linear first order partial differential equations in two independent variables.

UNIT – 5 : FOURIER SERIES (15h)

1. Introduction, Euler's formulae for Fourier series expansion of a function f(x), Dirichlet's conditions for Fourier series, convergence of Fourier series.

2. Functions having arbitrary periods. Change of interval, Half range series.

III. Reference Books:

1. Dr.M.D.Raisinghania, Ordinary and Partial Differential Equations, S. Chand & Company Pvt. Ltd., Ram Nagar, New Delhi-110055.

2. Dr. S.Sreenadh, S.Ranganatham, Dr.M.V.S.S.N.Prasad, Dr. V.Ramesh Babu, Fourier Series and Integral Transforms, S. Chand & Company Pvt. Ltd., Ram Nagar, New Delhi-110055.

3. Prof T.Amaranath, An Elementary Course in Partial Differential Equations Second Edition, Narosa Publishing House, New Delhi.

4. Fritz John, Partial Differential Equations, Narosa Publishing House, New Delhi, 1979.

5. I.N.Sneddon, Elements of Partial Differential Equations by McGraw Hill, International Edition, Mathematics series.

6. Web resources suggested by the teacher and college librarian including reading material.

IV. Co-Curricular Activities:

A) Mandatory:

1. For Teacher: Teacher shall train students in the following skills for 15 hours, by taking Relevant outside data (Field/Web).

1. On classification of first order partial differential equations, formation of partial differential equations.

2. Various methods of finding solutions of partial differential equations.

b) For Student: Fieldwork/Project work; Each student individually shall undertake Fieldwork/Project work and submit a report not exceeding 10 pages in the given format on the work-done in the areas like the Following**,** by choosing any one of the aspects.

1. Going through the web source like Open Educational Resources to find solutions of partial differential equations by using Lagrange's method, Charpit‟s method and Jacobi‟s method and make conclusions. (or)

2. Going through the web source like Open Educational Resources to find Integral Surface passing through a given curve and Surfaces orthogonal to a given system of Surfaces and make conclusions. (or)

3. Going through the web source like Open Educational Resources to find Fourier series expansions of some functions and applications of Parseval‟s theorem and make conclusions.

3. Max. Marks for Fieldwork/Project work Report: 05.

4. Suggested Format for Fieldwork/Project work Report: Title page, Student Details, Index page, Stepwise work-done, Findings, Conclusions and Acknowledgements.

5. Unit tests (IE).

b) Suggested Co-Curricular Activities

1. Assignments/collection of data, Seminar, Quiz, Group discussions/Debates

2. Visits to research organizations, Statistical Cells, Universities, ISI etc.

3. Invited lectures and presentations on related topics by experts in the specified area.

P. Srinivasa Reddy D. Usha Rani T. Venkateswarlu

T. Veeraiah

V. Suggested Question Paper Pattern:

Max.Marks:75 **Time:3 hrs**

SECTION - A (Total: 5 X 5 = 25Marks)

(Answer any **FIVE questions**. Each answer carries **5 Marks)**

1.
2.
3.
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9.
10.

SECTION - B (Total: 5 X 10=50Marks)

(Answer any **FIVE questions**. Each answer carries **10 Marks)**

11.
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16.
17.
18.
19.
20.

<u>NOTE</u> :- Paper Setter Must select <u>TWO</u> Short Questions and <u>TWO</u> Easy Questions from Each Unit

P. Srinivas Reddy T. Veeresh

D. Usha Rani

T. Venkateswarlu

VIKRAMA SIMHAPURI UNIVERSITY :: S.P.S.R.NELLORE

Semester-wise Revised Syllabus under CBCS, 2020-21
Four-year B.A. /B.Sc. (Hons) Domain Subject: **MATHEMATICS**
IV Year B.A./B.Sc.(Hons)– Semester – V

COURSE-7(C): NUMBER THEORY

(Skill Enhancement Course (Elective), 5 credits)

Max Marks: 100

I. Learning Outcomes:

Students after successful completion of the course will be able to

1. Find quotients and remainders from integer division, study divisibility properties of integers and the distribution of primes.
2. Understand Dirichlet multiplication which helps to clarify interrelationship between various arithmetical functions.
3. Comprehend the behaviour of some arithmetical functions for large n.
4. Understand the concepts of congruencies, residue classes and complete residues systems.
5. Comprehend the concept of quadratic residues mod p and quadratic non residues mod p.

II. SYLLABUS: (Hours: Teaching:75 (incl. unit tests etc.05), Training:15)

UNIT – 1 : DIVISIBILITY **(15h)**

1. Introduction, Divisibility, Greatest Common Divisor.
2. Prime numbers, The fundamental theorem of arithmetic, The series of reciprocals of the primes.
3. The Euclidean algorithm, The greatest common divisor of more than two numbers.

UNIT – 2 : ARITHMETICAL FUNCTIONS AND DIRICHLET MULTIPLICATION **(15h)**

1. Introduction, The Mobius function $\mu(n)$, The Euler totient function $\varphi(n)$, A relation connecting φ and μ, A product formula for $\varphi(n)$.
2. The Dirichlet product of arithmetical functions, Dirichlet inverses and Mobius inversion formula, The Mangoldt function $\Lambda(n)$.

UNIT – 3 : AVERAGES OF ARITHMETICAL FUNCTIONS **(15h)**

1. Introduction, The big oh notation. Asymptotic equality of functions, Euler‟s summation formula, some elementary asymptotic formulas.
2. The average order of $d(n)$, The average order of the divisor functions $\sigma_\alpha(n)$, The average order of $\varphi(n)$.
3. The average order of $\mu(n)$ and $\Lambda(n)$, The partial sum of a Dirichlet product, Applications of $\mu(n)$ and $\Lambda(n)$.

UNIT – 4 : CONGRUENCES **(15h)**

1. Definition and basic properties of congruences, Residue classes and complete residue systems.
2. Linear congruences, reduced residue systems and the Euler-Fermat theorem. Polynomial congruences modulo p. Lagrange‟s theorem.

UNIT – 5: QUADRATIC RESIDUES AND THE QUADRATIC RECIPROCITY LAW **(15h)**

1. Quadratic Residues, Legendre‟s symbol and its properties, Evaluation of (-1/p) and (2/p), Gauss lemma,
2. The Quadratic reciprocity law, Applications of the reciprocity law, The Jacobi Symbol.

III. Reference Books:

1. Tom M. Apostol, Introduction to Analytic Number theory, Springer International Student Edition.
2. David, M. Burton, Elementary Number Theory, 2nd Edition UBS Publishers.
3. Hardy & Wright, Number Theory, Oxford Univ., Press.
4. Dence, J. B & Dence T.P, Elements of the Theory of Numbers, Academic Press.
5. Niven , Zuckerman &Montgomery, Introduction to the Theory of Numbers.
6. Web resources suggested by the teacher and college librarian including reading material.

IV. Co-Curricular Activities:

A) Mandatory:

1. **For Teacher:** Teacher shall train students in the following skills for 15 hours, by taking Relevant outside data (Field/Web).

1. Finding quotient and numbers from integer division and the method of solving congruences. Further problems related to the theory of quadratic residues.
2. Applications of Lagrange‟s theorem.
3. Applications of the Chinese remainder theorem.
4. Applications of the reciprocity law.

2. **For Student: Fieldwork/Project work;** Each student individually shall undertake Fieldwork/Project work and submit a report not exceeding 10 pages in the given format on the work-done in the areas like the following**,** by choosing any one of the aspects.

1. Going through the web sources like Open Educational Resources and list out Applications of Lagrange‟s theorem, and make conclusions.(or)
2. Going through the web sources like Open Educational Resources and list out Applications of the Chinese remainder theorem and make conclusions.(or)
3. Going through the web sources like Open Educational Resource and list out Applications of the reciprocity law and make conclusions.

3. **Max. Marks for Fieldwork/Project work Report: 05.**
4. **Suggested Format for Fieldwork/Project work Report**: Title page, Student Details, Index Stepwise work-done, Findings, Conclusions and Acknowledgements.

V. Unit tests (IE).

b) Suggested Co-Curricular Activities

1. Assignments/collection of data, Seminar, Quiz, Group discussions/Debates
2. Visits to research organizations, Statistical Cells, Universities, ISI etc.
3. Invited lectures and presentations on related topics by experts in the specified area.

P. Srinivasa Reddy D. Usha Rani T. Venkateswarlu

V. Suggested Question Paper Pattern:

Max.Marks:75 **Time:3 hrs**

SECTION - A (Total: 5 X 5=25Marks)

(Answer any **FIVE questions**. Each answer carries **5 Marks)**

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

SECTION - B (Total: 5 X 10=50Marks)

(Answer any **FIVE questions**. Each answer carries **10 Marks)**

11.
12.
13.
14.
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20.

<u>NOTE</u> :- Paper Setter Must select <u>TWO</u> Short Questions and <u>TWO</u> Easy Questions from Each Unit

P. Srinivas Reddy T. Venkateswarlu

D. Usha Rani

VIKRAMA SIMHAPURI UNIVERSITY :: S.P.S.R.NELLORE

Semester-wise Revised Syllabus under CBCS, 2020-21
Four-year B.A. /B.Sc. (Hons) Domain Subject: **MATHEMATICS**
IV Year B.A./B.Sc.(Hons)– Semester – V

COURSE-6(D): DATA ANALYTICS METHODS & PROBABILITY

(Skill Enhancement Course (Elective), 5 credits)

Max Marks: 100

I. Course Objectives

I. Statisticians help to design data collection plans, analyze data appropriately and interpret and draw conclusions from those analyses. The central objective of the undergraduate major in Statistics is to equip students with consequently requisite quantitative skill that they can employ and build on in flexible ways.

2. Majors are expected to learn concepts and tools for working with data and have experience in analyzing real data that goes beyond the content of a service course in statistical methods for non-majors. Majors should understand [l] the fundamentals of probability theory, [2] statistical reasoning and inferential methods, [3] statistical computing, [4] statistical modeling and its limitations, and have skill in [5] description, interpretation and exploratory analysis of data by graphical and other means; [6] graduates are also expected to learn to communicate effectively.

Course Outcomes

After successful completion of this course, the student will be able to :

1. Knowledge of Statistics and its scope and importance in various areas such as Medical, Engineering, Agricultural and Social Sciences etc.
2. Knowledge related to Concept of Correlations.
3. Knowledge related to Concept of Regression.
4. Understand various finite difference Concepts and Interpolation Methods.
5. Knowledge related to Concept of Curve Fitting.
6. Knowledge to conceptualize the probabilities of events including frequent and axiomatic approach. Simultaneously, they will learn the notation of conditional probability.

II. SYLLABUS : (Hours: Teaching: 75 (incl. unit tests etc. 05), Training: 15)

UNIT – I : ***(15h)***

CORRELATION : Introduction, Meaning of Correlation, Types of correlation ,probable error, Karl-Pearson‟s coefficient of correlation for individual series only, Spearman‟s Rank correlation for individual series only. (Numerical Applications Only)

UNIT –II : ***(15h)***

REGRESSION : Introduction, definition, difference between correlation and regression, Simple linear regression, properties of regression coefficients, Regression equation x on y, Regression equation yon x, Simple Problems. (Numerical Applications Only)

UNIT – III : ***(15h)***

FINITE DIFFERENCES AND INTERPOLATION : Forward Differences - Backward differences. Newton's forward interpolation formula - Newton's backward interpolation formula. (Numerical Applications Only)

UNIT-IV : ***(15h)***

CURVE FITTING AND LINEAR TREND : Method of least squares, fitting of a straight line only. Linear trend and find trend values by the method of straight line trend. (Numerical Applications Only).

UNIT-V : *(15h)*

INTRODUCTION TO PROBABILITY AND PROBABILITY THEOREMS : Basic concepts of Probability, Conditional probability, Independent events Addition and multiplication theorems of probability for 2 events (Statement and proof), Addition and multiplication theorems of probability for n events (statement and proof), Bayees theorem Statement and proof and its applications.

NOTE : **1.** Concentration on numerical problems Only.
2. Proofs of theorems and Derivations of expressions are committed.

III. TEXT BOOKS :

1. Statistical Methods – Dr. S.P. Gupta – Chand & Sons.
2. Quantitative Techniques by C. Sathyadevi – S. Chand.
3. Fundamentals of Mathematical Statistics – S.C. Gupta & V.K. Kapoor

REFERENCE BOOKS :

1. Statistical Methods – Snedecor G.W. & Cochran W.G. Oxford & + DII.
2. Elements of Statistics – Mode. E.B. - Prentice Hall.
3. Fundamentals of Statistics – Goon Gupta & Das Gupta.

IV. Co-Curricular Activities:

A) Mandatory:

1. For Teacher: Teacher shall train students in the following skills for 15 hours, by taking relevant outside data (Field/Web).

1. Applications of correlation.
2. Applications of Rank correlation.
3. Applications of Regression.
4. Applications of Newton‟s forward formula.
5. Applications of Newton‟s backward formula.
6. Applications of fitting of a straight line.
7. Applications of Linear Trend.
8. Applications of probability.

2. For Student: Fieldwork/Project work : Each student individually shall undertake Fieldwork/Project work and submit a report not exceeding 10 pages in the given format on the work-done in the areas like the following**,** by choosing any one of the aspects.

1. For Collecting two different types of data and find Correlation and Conclusion.
2. For Collecting two different types of data and find Regression and Conclusion.
3. For Collecting the data from the identified sources like census department or electricity department by applying the Newton‟s interpolation formula making observations and drawing conclusions.
4. For Collecting two different types of data and find a straight line for best fit.

3. Max. Marks for Fieldwork/Project work Report: 05.
4. Suggested Format for Fieldwork/Project work Report : Title page, Student Details, Index page, Stepwise work-done, Findings, Conclusions and Acknowledgements.

V. Unit tests (IE).

b) Suggested Co-Curricular Activities :

1. Assignments/collection of data, Seminar, Quiz, Group discussions/Debates
2. Visits to research organizations, Statistical Cells, Universities, ISI etc.
3. Invited lectures and presentations on related topics by experts in the specified area.

P. Srinivasa Reddy D. Usha Rani T. Venkateswarlu

BLUEPRINTOFQUESTION PAPER
(INSTRUCTIONS TO PAPER SETTER)

VIKRAMA SIMHAPURI UNIVERSITY :: NELLORE.

B.A./B.Sc. THIRD YEAR MATHEMATICS (**SEMESTER–V)**

COURSE–6 (D) DATA ANALYTICS METHODS & PROBABILITY

NOTE :- Paper Setter Must select TWO Short Questions and TWO Easy Questions from Each Unit as Follows

UNIT	TOPICS	5 MARKS QUESTIONS	10 MARKS QUESTIONS
UNIT – I	CORRELATION RANK CORRELATION	1 (Problem) 1 (Problem)	1 (Problem) 1 (Problem)
UNIT - II	REGRESSION	2 (Problems)	2 (Problems)
UNIT - III	FORWARD DIFFERENCES BACKWARD DIFFERENCES	1 (Problem) 1 (Problem)	1 (Problem) 1 (Problem)
UNIT - IV	CURVE FITTING LINEAR TREND	2 (Problems) -	1 (Problem) 1 (Problem)
UNIT - V	PROBABILITY	1(Theorem) 1(Problem)	1(Theorem) 1(Problem)

P. Siva Sankar Reddy D. Usha Rani T. Venkateswarlu

T. Vasudeva Reddy

VIKRAMA SIMHAPURI UNIVERSITY :: NELLORE.

B.A./B.Sc. THIRD YEAR MATHEMATICS (**SEMESTER–V)**

COURSE - 6(D) DATA ANALYTICS METHODS & PROBABILITY

MODEL PAPER

Time : 3 hours **Max. Marks : 75**

PART-A

I. Answer any FIVE of the following Questions : ***5 X 5 = 25 Marks***

1. Find Correlation Coefficient to the Following data $\sum x^2 = 222, \sum y^2 = 364, \sum xy = 261$.

2. The ranks of two subjects A and B are given below. Obtain rank correlation coefficient.
(3, 2), (4, 4), (1,1), (2,3), (6, 6), (5,5)

3. For certain X and Y series which are correlated the two regression lines are $5X - 6Y + 90 = 0$, $15X - 8Y - 130 = 0$ Find the means of the two series.

4. Find regression coefficients from the following regression equations $8X - 10Y + 66 = 0$, $40X - 18Y = 214$.

5. Construct a forward difference table from the following.

x	0	1	2	3	4
y	1	1.5	2.2	3.1	4.6

6. Construct a backward difference table for $y = \log x$ given that

X	10	20	30	40	50
y	1.0000	1.3010	1.4771	1.6021	1.6990

Find the value of $\nabla^4 \log 50$

7. Explain Method of Least Squares for fitting a straight line.

8. To find Normal Equations for fitting a straight line.

X	1	2	3	4	5
Y	14	27	40	55	68

9. State and prove Addition theorem for 2 events in probability.

10. The probability that a student passes in the Qt test is $\frac{1}{3}$ and in Commerce and Qt test is $\frac{1}{4}$ if the probability of at least one subject is $\frac{5}{6}$ find the probability that the students passes in Commerce.

PART-B

II. Answer Any <u>FIVE</u> Questions each question carries equal marks.: ***5 X 10 = 50 Marks***

11. Calculate coefficient of correlation of the following data

X	10	12	13	16	17	20	25	30	34
Y	20	22	26	27	29	33	37	40	42

12. Calculate rank correlation of the following data :

X	72	70	46	69	56	65	65	45	35	75
Y	111	110	105	112	115	115	101	118	107	120

13. Calculate regression equation of Y on X from the following data :

X	40	38	35	42	30
Y	30	35	40	36	29

14. In correlation study the following values are obtained :

	X	Y
Mean	**65**	**67**
Standard Deviation	**2.5**	**3.5**

Coefficient of Correlation : 0.8. Find the two regression equations that are associated with the above values.

15. Find $f(1.6)$ by using appropriate Interpolation formula from the following table :

X	1	1.4	1.8	2.2	1
Y	3.49	4.82	5.96	6.5	3.49

16. Find $f(3.5)$ by using appropriate Interpolation formula from the following table :

X	0	1	2	3	4
Y	3	4	7	8	10

17. Fit a Straight line to the form y=a+bx for the following data :

X	0	5	10	15	20	25
Y	12	15	17	22	24	30

18. Fit a straight line trend for the following series. Estimate the value for 2012 :

Year	2001	2002	2003	2004	2005	2006	2007
Production of Steel (M. Tones)	60	72	75	65	80	85	95

19. State and prove multiplication theorem for „n" events.

20. First box contains 2 black, 3 red, 1 white balls. Second box contains 1 block, 1 red, 2 white balls and third box contains 5 black, 3 red, 4 white balls. Of these a box is selected at random. From it a red ball is randomly drawn. If ball is red, find the probability that is from second box.

<u>NOTE</u> :- Paper Setter Must select <u>TWO</u> Short Questions and <u>TWO</u> Easy Questions from Each Unit

P. Srinivasa Reddy D. Usha Rani T. Venkateswarlu

T. Venkatesh

VIKRAMA SIMHAPURI UNIVERSITY :: S.P.S.R.NELLORE

Semester-wise Revised Syllabus under CBCS, 2020-21
Four-year B.A. /B.Sc. (Hons) Domain Subject: **MATHEMATICS**
IV Year B.A./B.Sc.(Hons)– SEMESTER – V

COURSE-7(D): OPTIMIZATION TECHNIQUES

(Skill Enhancement Course (Elective), 5 credits)

Max Marks : 100

I. Course Objective:

The central objective of optimization is "to do thing best under the given circumstances". This general concept has great many applications, for instance, in data analysis, engineering system design, inventory control, man power and resource allocation and building capabilities in the students for analyzing different situations in the industrial/business scenario.

Course Outcomes:

1. Recall the theoretical foundations of various issues related to linear programming modeling to formulate real-world problems as a LP model
2. Explain the theoretical workings of the graphical, simplex and analytical methods for making effective decision on variables so as to optimize the objective function.
3. Identify appropriate optimization method to solve complex problems involved in various industries.
4. Demonstrate the optimized material distribution schedule using transportation model to minimize total distribution cost.
5. Find the appropriate algorithm for allocation of resources to optimize the process of assignment.
6. Explain the theoretical workings of sequencing techniques for effective scheduling of jobs on machine.

II.* SYLLABUS *: *(Hours : Teaching : 75 (incl. unit tests etc. 05), Training : 15)*

UNIT-I : ***(15h)***

Introduction to Operations Research, Definition of OR, Applications of OR, Limitations of OR, Linear programming problem (LPP), Introduction, Mathematical formulation of the LPP, Applications and Limitation of LPP.

UNIT-II : ***(15h)***

Linear Programming Problem – Solution of LPP Using Graphical Method and Simplex Method ($\leq$ inequality only).

UNIT-III : ***(15h)***

Transportation problem: Mathematical formulation, IBFS of transportation problem using north-west corner rule, least-cost method and Vogel‟s approximation method, Simple problems.

UNIT-IV : ***(15h)***

Assignment problem, definition, mathematical formulation of assignment problem, solution of assignment problem using Hungarian algorithm, unbalanced assignment problem, simple problems, Difference between Assignment and transportation Problem.

UNIT-V : ***(15h)***

Introduction – Definition – Terminology and Notations Principal Assumptions,Problems with n Jobs through Two Machines Problems with n Jobs through Three Machines.

III. Prescribed Text Book:
Operations Research (2nd Edition) by S.Kalavathi, Vikas Publications Towers Pvt. Ltd.

Scope:
UNIT-I: 1.1, 1.2, 1.3, 1.5, 1.6, 1.7
UNIT-II: 2.1, 2.2, 2.2.1, 2.2.2, 3.1, 3.1.1, 4.1, 4.2, 4.3
UNIT-III: 8.1, 8.2, 8.3, 8.4.1, 8.4.2, 8.4.3
UNIT-IV: 9.1, 9.2, 9.2.1, 9.2.2, 9.3, 9.4
UNIT-V: 12.1, 12.2, 12.2.1, 12.2.2, 12.3, 12.4

Reference books :
1. Operations Research by Kanthiswaroop, P.K.Gupta, Manmohan by Sultan Chand & Sons
2. Operations Research by SD. Sharma, Published by Kedhar Nath ram Nath – Meerut.

INSTRUCTIONS TO PAPER SETTER:-
1. **Two questions must be given from each unit in Part-A and Part-B**
2. Number of constraints in LPP should be less than or equal to 3.
3. The order of transportation and assignment matrix should be less than or equal to 5.

IV. Co-Curricular Activities:
A) Mandatory:
1. For Teacher: Teacher shall train students in the following skills for 15 hours, by taking relevant outside data (Field/Web).
1. Applications of Simplex method.
2. Applications of Graphical method
3. Applications of Transportation problem in different methods.
4. Applications of Assignment problem.
5. Problems with n-jobs through 2 machines
6. Problems with n-jobs through 3 machines

2. For Student: Fieldwork/Project work; Each student individually shall undertake Fieldwork/Project work and submit a report not exceeding 10 pages in the given format on the work-done in the areas like the following**,** by choosing any one of the aspects.

Collect the data from different organizations and how to apply optimization techniques for collected data.

3. Max. Marks for Fieldwork/Project work Report: 05.
4. Suggested Format for Fieldwork/Project work Report: Title page, Student Details, Index page, Stepwise work-done, Findings, Conclusions and . Acknowledgements.
V. Unit tests (IE).
b) Suggested Co-Curricular Activities:
1. Assignments/collection of data, Seminar, Quiz, Group discussions/Debates
2. Visits to research organizations, Statistical Cells, Universities, ISI etc.
3. Invited lectures and presentations on related topics by experts in the specified area.

P. [illegible] D. Usha Rani T. Venkateswarlu

T. [illegible]

BLUE PRINT OF QUESTION PAPER
(INSTRUCTIONS TO PAPER SETTER)
SEMESTER–V
COURSE–7(D) OPTIMIZATION TECHNIQUES

NOTE :- Paper Setter Must select TWO Short Questions and TWO Easy Questions from Each Unit as Follows

UNIT	TOPICS	5 MARKS QUESTIONS	10 MARKS QUESTIONS
UNIT - I	Introduction of OR	1(Theory)	1(Theory)
	LPP	1(Theory)	1 (Problem)
UNIT -II	Simplex Graphical Method	1(Theory) 1(Problem)	2(Problems)
UNIT -III	Transportation	2(Problems)	2(Problems)
UNIT - IV	Assignment Problem	1(Theory) 1(Problem)	2(Problems)
UNIT - V	Job Sequencing	1(Theory) 1(Problem)	2(Problems)

P. Srinivas Reddy
T. Veeraiah

D. Usha Rani

T. Venkateswarlu

VIKRAMA SIMHAPURI UNIVERSITY :: NELLORE.

B.A./B.Sc. THIRD YEAR MATHEMATICS (**SEMESTER–V)**

COURSE-7(D) OPTIMIZATION TECHNIQUES

MODEL QUESTION PAPER

TIME : 3 Hours ***Max. Marks : 75***

PART – A

I. Answer any FIVE Questions : ***5 X 5 = 25M***

1. Explain the origin and development of operation research.
2. Explain the procedure to formulate a linear programming problem.
3. Explain the Simplex method to solve a linear programming problem.
4. Solve the following LPP by using graphical method

   Max $Z = 8x_1 + 5x_2$

   Subject to : $2x_1 + x_2 \leq 500$

   $X_1 \leq 150$

   $x_2 \leq 250$

   $x_1 , x_2 \geq 0$
5. Determine an initial basic feasible solution to the following transportationproblem using North-west corner rule.

	D_1	D_2	D_3	D_4	Supply
O_1	6	4	1	5	14
O_2	8	9	2	7	16
O_3	4	3	6	2	5
Demand	6	10	15	4	

6. Determine an initial basic feasible solution to the following transportation problem using least cost method.

	B_1	B_2	B_3	B_4	Availability
A_1	2	3	1	0	20
A_2	6	7	4	1	35
A_3	5	6	8	4	15
Requirement	20	15	20	15	

7. Write the Differences between Transportation Problem and Assignment Problem.

8. Solve the following Assignment problem which Minimize the Total Cost.

	I	*II*	*III*	*IV*
1	5	7	1	4
2	2	3	4	6
3	4	1	3	5

9. Explain the assumptions involved in sequencing problem.

10. There are five jobs each of which must go through the two machines A and B in the order A B processing times are given below.

JOB	**1**	**2**	**3**	**4**	**5**
Machine-A	5	1	9	3	10
Machine-B	2	6	7	8	4

Determine a sequence for the five jobs that will minimize the total elapsed time.

PART - B

II. Answer any FIVE of the following Questions. 5 X 10 = 50 M

11. Explain advantages and limitations of operations research.
12. A paper mill produces two grades of paper namely x and y owing to raw material restrictions it cannot produce more than 400 tons of grade x and 300 tons of grade y in a week. There are 160 production hours in a week. It requires 0.2 and 0.4 hours to produce a ton of products x and y respectively with corresponding profits of Rs. 200/- and Rs. 500/- per ton. Formulate the above as an LPP to maximize profit.
13. Solve the LPP by using graphical methodobjective function :

$\max z = 3x_1 + 4x_2$

Subject to : $4x_1 + 2x_2 \le 80$

$2x_1 + 5x_2 \le 180$

$x_1 \ge 0,\ x_2 \ge 0$

14. Use simplex method to solve the LPP.

objective function : $\max z = 3x_1 + 2x_2$

Subject to : $x_1 + x_2 \le 4$

$x_1 - x_2 \le 2$

$x_1 \ge 0,\ x_2 \ge 0$

15. Use vogel"s approximation method to obtain an initial basic feasible solutionof the transportation problem.

	D	E	F	G	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250	

16. Find the initial basic feasible solution for the following data using least cost method.

	A	B	C	Available
1	2	7	4	5
2	3	3	1	8
3	5	4	7	7
4	1	6	2	14
Demand	7	9	18	

17. A department head has four tasks to be performed and three subordinates, the subordinates differ in efficiency the estimates of the time, each subordinate would taketo perform is given below in the matrix. How should he allocate the tasks one to each man, so as to minimize the total Men - Hours?

Task	***1***	***2***	***3***
I	9	26	15
II	13	27	6
III	35	20	15
IV	18	30	20

18. Solve the following assignment problem in order to minimize the total cost. The matrix given below gives the assignment cost when different operators are assigned to various machines.

	I	*II*	*III*	*IV*	*V*
A	30	25	33	35	36
B	23	29	38	23	26
C	30	27	22	22	22
D	25	31	29	27	32
E	27	29	30	24	32

19. In a factory, there are Six Jobs to perform, each of which should go through two machines A and B, in the order A, B. The processing time (in hours) for the Jobs are given below. You are required to determine the sequence for performing the Jobs that would minimize the total elapsed time T, what is the value of T?

JOB	J_1	J_2	J_3	J_4	J_5	J_6
Machine-A	1	3	8	5	6	3
Machine-B	5	6	3	2	2	10

20. We have five jobs each of which must go through the machines A, B and C in the order A B C.Determine the sequence that will minimize the total elapsed time.

JOB	***1***	***2***	***3***	***4***	***5***
Machine-A	5	7	6	9	5
Machine-B	2	1	4	5	3
Machine-C	3	7	5	6	7

NOTE :- Paper Setter Must select TWO Short Questions and TWO Easy Questions from Each Unit

Co-Curricular Activities :

A) Mandatory :

1. **For Teacher :** Teacher shall train students in the following skills for 15 hours, by taking relevantoutside data (Filed/Web).
   1. Applications of Lpp by using Graphical method and simplex method.
   2. Applications of North-west corner rule, least-cost method Vogel‟s approximation method.
   3. Applications of Assignment problem using Hungarian method.
   4. Applications of n jobs through two machines and n jobs through three machines.

2. **For student** : Filed work/Project work: Each student individually shall undertake Field work / Project work and submit a report not exceeding 10 pages in the given format on the work-done inthe areas like the following, by choosing any one of the aspects.
   1. Collecting data from the identified the sources like any manufacturing companies by using thelinear programming problem using graphical method or simplex method.
   2. Collecting data from the availability of the sources and the requirement of the destinations by using transportation problem and applying north-west corner rule, least-cost method and Vogel‟s approximation method comparing the solutions which method gives minimum transportation cost.

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