DR-A NW 05/8/25

SRI VENKATESWARA UNIVERSITY COLLEGE OF SCIENCES : : TIRUPATI

DEPARTMENT OF MATHEMATICS

Prof. D.Bharathi,
BOS, Chairperson,
Department of Mathematics,
S.V.U. College of Sciences,
Tirupati.

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Date:04-08-2025

To
The Dean,
College Development Council ,
S.V. University,
Tirupati

THROUGH PROPER CHANNEL

Respected Sir,

Sub: - Amendments related to Courses of III & IV Semesters of M.Sc. Mathematics & M.Sc. Applied Mathematics - 308:OOTC-II/Open Elective and two OOSDC/ SDC 401 and 402 –Reg.

Ref: - CII (A&F)/3rd & 4th Sem. Amen./2025 dated 25-07-2025.

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With the reference to the letter cited above, the internal Board of Studies of Mathematics (PG) met on 29-07-2025 and amended the courses 308:OOTC-II of III Semester with OOTC-II/ Open Elective & Two OOSDC of IV Semester with two OOSDC/SDC 401 and 402 of M.Sc., Mathematics & M.Sc., Applied Mathematics . This will be implemented with immediate effect for the Academic year 2025-26.

I attach herewith the syllabus of 308: Open Elective and 401 & 402 SDC of III and IV Semesters of M.Sc., Mathematics & M.Sc., Applied Mathematics and resolutions of the meeting of Board of studies in Mathematics for taking further action.

Thanking you

Yours faithfully,

I/c

HEAD
DEPARTMENT OF MATHEMATICS
S.V.U. COLLEGE OF SCIENCES
S.V.UNIVERSITY TIRUPATI

(D. BHARATHI)
BOS, CHAIRMAN
Department of Mathematics
S.V.U.C.S., TIRUPATI.

Encl: 1. The Minutes of the meeting BOS, Department of Mathematics.
2. Courses and Syllabi of 308(III Sem), 401 & 402 (IV Sem) of M.Sc., Mathematics and M.Sc., Applied Mathematics.

PRINCIPAL
S.V.U. COLLEGE OF SCIENCES
S.V. UNIVERSITY, TIRUPATI-517502

7-8-2025

Sri Venkateswara University:TIRUPATI
S.V.U College of Sciences
Department of Mathematics
Minutes of the BOS Meeting

The BOS meeting of Department of Mathematics held on 29-07-2025 at 11.30 am in the chambers of the Head, Department of Mathematics, SVU College of Sciences, SriVenkateswara University, Tirupati.

Agenda: To discuss the courses in place of 308: OOTC-II of III Semester and Two OOSDC courses of IV Semester of M.Sc., Mathematics and M.Sc., Applied Mathematics.

1. 308: Open Elective of III Semester and
2. 401 & 402 Skill Development Courses of IV Semester.

The Members present:

S.No	Name of the member	Role	Signature
1.	Prof.D. Bharathi	BOS,Chairperson	DBh
2.	Prof.V.Sugunamma	Internal Member	V.Sugun
3.	Prof.C.Jaya Subba Reddy Head of the Department	Internal Member	JSReddy
4.	Prof. A. Sudhakaraiah	Internal Member	AR

It is resolved and approved the following courses based on suggestions of Members.

Resolutions:

After the thorough discussions, the following points are resolved unanimously.

1. As per the discussions of Board of Studies members; the following courses are offered:
   - For Course 308: OOTC-II / Open Elective
     "Business Mathematics-I" course is offered as open elective (III semester) for other Departments.
   - For Two OOSDC/ Two SDCs:
     i).401-SDC: Algebraic coding Theory & 402-SDC: Introductory Methods of Numerical Analysis for IV Semester of M.Sc., Mathematics.
     ii). 401-SDC: Continuum Mechanics & 402- SDC: Introductory Methods of Numerical Analysis for IV Semester of M.Sc., Applied Mathematics.
2. The syllabi framed for the above courses of M.Sc., programme, consists of four units covering all the basic concepts relevant to the disciplines.
3. The proposed syllabi for the above courses is unanimously approved by the Board of Studies after some deliberations and submitted to the Academic Council for final approval.

DBh

Prof..D.Bharathi

BOS Chairperson

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Department of Mathematics
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SVU COLLEGE OF SCIENCES, SVU, TIRUPATI
DEPARTMENT OF MATHEMATICS
Open Elective (Other Departments)
III SEMESTER: M.Sc., MATHEMATICS/APPLIED MATHEMATICS
308: BUSINESS MATHEMATICS -1

Course Objectives:

i. To understand the basic concepts of Mathematics.
ii. To calculate percentages- profit and loss.
iii. To solve Linear equations.
iv. To understand Conversion of one Number System to Another.

Unit – I

Number- H.C.F. and L.C.M. of Numbers - Decimal Fractions.

Unit - II

Surds and Indices – Percentage - Profit and loss.

Unit - III

Linear Equations in Two Variables – Ratio and Proportion- Variation.

Unit -IV

Number System: Types of Number Systems – Conversion of Decimal Number to Binary Number and Vice versa -Conversion of Decimal numbers to Octal numbers and Vice versa - Conversion of Hexadecimal number into Decimal number and Vice versa - Binary Arithmetic.

Scope and Standard Treatment as in Chapters 1,2,3,9,10,11,31,12 of"**OBJECTIVEARITHMETIC**" , by **R.S.AGGARWAL , S.Chand and Company.**
Scope and Standard Treatment as in Chapter 1 of "**BUSINESS MATHEMATICS**", by **P.R.VITTAL , MARGHAM PUBLICATIONS.**

Course Outcomes:

i. Apply the knowledge in mathematics (algebra, matrices, calculus) in solving business problems.
ii. Analyse and demonstrate mathematical skills required in mathematically intensive areas in Economics and business.
iii. Explain the concepts and use equations, formulae and mathematical expressions and relationships in a variety of contexts
iv. Understand The Binary Octal, Octal, Decimal and Hexadecimal Systems.

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IV SEMESTER: M.Sc., MATHEMATICS

MAT 401: SDC-I: ALGEBRAIC CODING THEORY

Course Objectives:

i. To develope the knowledge among students about coding and decoding.
ii. To explain linear codes and reliability of IMLD.
iii. To study Hamming codes and extended Golay codes
iv. To Introduce cylic codes and polynomial Encoding and Decoding.

UNIT –I :

Introduction to Coding Theory: Introduction –Basic Assumptions- Correcting and Detecting Error Patterns-Information Rate-The Effects of Error Corrections and Detection-Finding the Most Likely Codeword Transmitted-Some Basic Algebra-Weight and Distance –Maximum Likelihood Decoding-Reliability of MLD-Error-Detecting Codes-Error-Correcting Codes.

UNIT – II:

Linear Codes: Two Important Subspaces-Independence, Basis, Dimension-Matrices-Bases for C= < S > and C?-Generating Matrices and Encoding-parity –Check Matrices-Equivalent Codes-Distance of a Linear Code-Cosets-MLD for Linear Codes- Reliability of IMLD for Linear Codes.

UNIT – III:

Perfect and Related Codes- Some Bounds for Codes-Perfect Codes-Hamming Codes-Extended Codes-The Extended Golay Code- Decoding the Extended Golay Code- The Golay Code –Reed-Mullar Codes-Fast Decoding for RM (1,m)

UNIT-IV:

Cyclic Linear Codes; Polynomials and Words – Introduction to Cyclic Codes-Polynomial Encoding and Decoding –Finding Cyclic Codes-Dual Cyclic Codes.

Scope and Standard as in Sections 1.1 to 1.12 of Chapter 1, sections 2.1 to 2.12 of Chapter 2, sections 3.1 to 3.9 of chapter 3, sections 4.1 to 4.5 of chapter 4 and sections **"Coding Theory the Essentials: by D.G. Hoffman, D.A Leonard, C.C. Lindner, K.T. Phelps, C.A. Rodger, J.R. Wall**, Monographs and text books in pure and Applied Mathematics.

References: 1. Algebraic coding theory and Applications Longo. G. Hartmenn C.R. Springer publications
2. Introduction to coding theory by J.H. Vanlint, Springer publications.
3. Introduction to Algebraic and combinatorial coding theory, Academi press,INC. Newyork,1977.
4. The Theory of ERROR Correcting codes by N.J.A.Sloane, Vol I&V,North –Holland Amsterdam,1977.

Course Out comes:

i. Analyze Error detecting and error correcting codes.
ii. Understand and apply algorithms in applications like sending messages without errors.
iii. Obtain bounds for different types of codes.
iv. Understand the polynomial encoding and decoding.

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MAT 402: SDC-II: Introductory Methods of Numerical Analysis
(Common with paper AMA 402: SDC-II of Branch I (B) Applied Mathematics)

Course objectives:

i. To provide suitable Numerical Methods, for solving ordinary and Partial Differential Equations.
ii. To study Finite difference Approximations.
iii. To learn Iterative Methods for the solution of Equations.
iv. To study the various methods of Approximations..

UNIT-I:
Numerical Solution of Ordinary Differential Equations: Predictor- Corrector Methods-The Cubic Spline Method-Boundary Value Problems.
[Sections 7.1, 7.7 & 7.10 of Chapter-7 of the Text Book]

UNIT-II:
Numerical Solution of Partial Differential Equations: Introduction-Finite Difference Approximations to Derivatives-Laplace's equation.
[Sections 8.1, 8.2, 8.3 of Chapter-8 of the Text Book]

UNIT-III:
Numerical Solution of Partial Differential Equations (Continued):Parabolic Equations-Iterative Methods for the Solution of Equations-Hyperbolic Equations-Software for Partial Differential Equations.
[Sections 8.4, 8.5, 8.6 & 8.7 of Chapter-8 of the Text Book]

UNIT-IV:
The Finite Element Method: Introduction-Methods of Approximation-Application to Two-dimensional problems.
[Sections 10.1,10.2 &10.3 of Chapter-10 of the Text Book]

Text Book:
Scope and standard as "**Introductory methods for Numerical Analysis by S.S.Sastry fourth edition**".

Reference Book:
1. An Introduction to Numerical Analysis by Kendall E. Atkinson.
2. Theory and problems in Numerical Methods with programs in C and C++.
3. Numerical Methods and computing by Ward Cheney and David Kincaid
4. Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S.R K. Iyengar, R. K. Jain, New Age International (p) Limited, Publishers, 5th Edition

Course Outcomes: From this Course Students are able to

i. Solve ordinary and Partial Differential equations using numerical Methods.
ii. Understand Laplace's Equation.
iii. Study Parabolic and Hyperbolic equations.
iv. Learn Methods of Approximation.

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IV SEMESTER: M.Sc., APPLIED MATHEMATICS

AMA 401: SDC-1: CONTINUUM MECHANICS

Course Objectives:

i. The purpose of the course is to expose the students to the basic elements of continuum mechanics in a sufficiently rigorous manner.

ii. To provide advanced treatment of the fundamental, unifying concepts of the mechanics of continua such as mechanics of viscous fluids, two dimensional flows.

UNIT I:

Kinematics of Fluids in motion (Chapter 2).

UNIT-II

Equations of motion of a Fluid (Chapter 3)

UNIT: III

Some Three –Dimensional Flows(Chapter 4)

UNIT IV :

Some two –Dimensional Flows. (Sections 5.1 to 5.9 of Chapter 5) Scope and standard as in the book **" Text Book of Fluid Dynamics" by F. Chorlton, C.B.S Publishers and Distributors , Delhi, 1985**

References :

1. D.S. Chandrasekharaiah and L. Debnatha Continuum Mechanics – Academic Press -1994
2. A.J.M. Speneer : Continuum Mechanics Long Man, 1980
3. Y. C. Feng, A first Course in Continuum Mechanics – Prentice Hall (2^{nd} Edition) 1997

Course Outcomes:

i. Be able to describe motion, deformation and forces in a continuum.

ii. Be able to derive equations of motion and conservation laws for a continuum.

iii. Understand constitutive models for fluids and viscoelastic solids.

iv. Formulate and solve specific technical problems of displacement, strain and stress.

v. Perform experiments with stresses and deformations.

vi. Numerically model and analyse the stresses and deformations of simple geometries under an arbitrary load in both solids and liquids.

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PROGRAMME: M.Sc.,(MATHEMATICS & APPLIED MATHEMATICS)
SRI VENKATESWARA UNIVERSITY::TIRUPATI
S.V.U.COLLEGE OF SCIENCES
DEPARTMENT OF MATHEMATICS

Instructions for evaluation:-The Open Elective and Skill Development Courses are evaluated for 100 Marks out of which 70 Marks through end examination and internal assessment would be for 30 Marks. The minimum marks for qualifying in theory subject shall be 40%.

1. **End Examination Question Paper Pattern is as follows:**

Section A&B	Questions	Units of the Syllabus	Marks
A	Questions 1 To 8 (four short answer Questions, TWO from each unit)	Form UNIT-I to UNIT-IV	4x5=20
B	Questions 9.(a) & (b) or 10 .(a) &(b)	Form UNIT-I	12.5
B	Questions 11. (a) &(b) or 12.(a) &(b)	From UNIT-II	12.5
B	Questions 1. (a) &(b) or 14.(a) &(b)	From UNIT-III	12.5
B	Questions 15(a) &(b) or 16(a) &(b)	From UNIT-IV	12.5
		Total:	70

2. Procedure to evaluate internal examinations:Theory:

Internal Examinations –I &II	30 marks

The pattern for the internal examination: 30 marks will be divided into descriptive (two out of four questions in Section A, each carries 5 marks and two questions in Section B, each carries 10 marks with internal choice & 60 minutes duration).

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Note : If the final marks are in fraction, it shall be rounded off to the next number

- If the student is absent for the internal examination, no re-exam shall be conducted If the student failed to attend both the internal examinations, his/her aggregate marks shall be considered zero.

  - Final internal semester marks shall be awarded as average of two internal examinations.
  - Internal marks will be awarded by internal examiner only.

Open elective eligibility criterion:

For all branches of B.SC/BA/B.Com without Mathematics background (Submit Degree certificate Xerox).

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Model Question Paper:

M.Sc DEGREE EXAMINATION

BRANCH-MATHEMATICS

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

SECTION- A

Answer any FOUR questions. Each question carry 5 marks (4 x 5=20).

Two questions must be given from each unit.

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

SECTION- B

Answer ALL questions. Each question carries 12.5 marks (4 x 12.5=50).

Two questions must be given from each unit.

9. (a) & (b)

(or)

10. (a) & (b)

11. (a) & (b)

(or)

12. (a) & (b)

13. (a) & (b

(or)

14. (a) & (b)

15. (a) & (b)

(or)

16.(a) & (b)

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B- 236-03-08

M.Sc DEGREE EXAMINATION
THIRD SEMESTER
BRANCH:-MATHEMATICS
308: Open Elective: Business Mathematics-I
(Regular/Supplementary)

Time: 3hours — Marks: 70

Answer any FOUR questions.

All questions carry equal marks.

(Marks : $4 \times 5 = 20$)

1. If $47.2506 = 4A + \frac{7}{B} + 2C + \frac{5}{D} + 6E$, then find the value of $5A + 3B + 6C + D + 3E$.

2. What is the unit digit in $(3157)^{754}$?

3. Evaluate 45% of 280 + 28% of 450.

4. If $abc = 1$ then $\frac{1}{1+a+b^{-1}} + \frac{1}{1+b+c^{-1}} + \frac{1}{1+c+a^{-1}} = 1$.

5. If $4a = 5b$ and $8b = 9c$, then find $a : b : c$.

6. Two numbers are in the ratio of 3 : 5. If each number is increased by 10, the ratio becomes 5 : 7, then find the numbers.

7. Convert the decimal number 44_{10} into octal.

8. Conversion 14_{10} of decimal into binary.

PART - B

Answer ALL questions.

Ea... rks.

(Marks: $4 \times 12.5 = 60$)

UNIT - I

9. (a) Find the H.C.F and L.C.M of 1.5, 3, 0.6.

   (b) Find the L.C.M of 15, 18, 24, 27, 56.

Or

[P.T.O.]

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10. Evaluate

(a) $869 \times 738 + 869 \times 262$

(b) What is the unit digit in $3^{57} \times 6^{41} \times 7^{63}$.

UNIT – II

11. By selling 100 pens a shopkeeper gains the selling price of 20 pens. Find his gain percent.

Or

12. Rs. 395 are divided among A, B and C in such a manner that B gets 25% more than A and 20% more than C. Find the share of A?

UNIT – III

13. Solve $\frac{3x-y+1}{3}=\frac{2x+y+2}{5}=\frac{3x+2y+1}{6}$.

Or

14. (a) If a : b = 1 : 3, b : c = 5 : 7 and c : d = 9 : 8. Find a : b : c : d.

(b) On dividing a sum of Rs. 832 between A and B in the ratio $\frac{1}{3}:\frac{1}{5}$, then find their shares.

UNIT – IV

15. (a) Convert $(190)_{10}$ into hexa decimal.

(b) Covert $(B5)_{16}$ into decimal.

Or

16. (a) How to convert of decimal into binary with examples.

(b) Add $111100_2 + 011111_2$.

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B-236-03-08

M.Sc DEGREE EXAMINATION
FOURTH SEMESTER
BRANCH:-MATHEMATICS
MAT 401 : SDC-I: ALGEBRAIC CODING THEORY
(Regular/Supplementary)

Time: 3hours **Marks: 70**

SECTION-A

Answer any **FOUR** questions. All questions carry **equal** marks. 4X5=20

1. Define binary code and Block code. List all words of length 3?
2. Modify C_1={00,01,10,11} by (i) repeating each code word three times
   (ii) by adding a third digit to each code word so that number of each code word is even?
3. Define linear code. Give an example for linear Code and not a linear code?
4. List the cosets of the linear code C= {0000, 1011, 0101, 1110}?
5. If $0\leq t\leq n$ and if v is a words of length n, then find the number of words of length n of distance at most t from v is precisely ?
6. Find an upper bounds for the size or dimension of a linear codes with the values n=8,d=3 & n=23,d=27 ?
7. Represent each code word C with the polynomials a) C= {000,001,010,011}
   b) C ={0000,0001,1110}
8. Let $g(x) = 1+x^2+x^3$ let the generator of a linear cyclic code of length 7. Find the message polynomial corresponding to the code words C(x); $x^2+x^4+x^5$, $x+x^2+x^4$, $x^2+x^3+x^4+x^6$

SECTION-B

Answer **ALL** questions. All questions carry **equal** marks **4X12.5=50**

UNIT – I

9. a) Let C be a code word of length 3. Add a parity check digit to the codewords in the code and use the resulting code C to answer the following questions
   i) If 1101 is received can we detect an error?
   ii) If 1101 is received what codewords were most likely to have been transmitted?
   iii) Is any word of length 4 that is not in the code, closest to a unique codeword?
   b) Let |M|=2, n=3 and C={000,111}. If v=000 transmitted, when will IMLD conclude this correctly, and when will IMLD incorrectly conclude that 111 was sent?

(OR)

10. a)Define Hamming weight and Hamming distance. Let u=01011, v=11010,w=01100 compare the following pair of quantities:
    i) ut(u+w),and wt(v)= wt(w)
    ii) d (v. w),and d(y, u)+d(u,w)
    b) Suppose p=.90, |M|=3, n=4, and C= {0000, 1010, 0111},For each v in C, we compute øp(C, v) ?

UNIT – II

11. a) Show that C= {0000, 1100, 0011, 1111} is a linear code that its distance is d=2?
    b) Explain the following terms with examples i) Linear Independent set
    ii) Basis
    iii) Dimension

(OR)

12. a) Test for Linear Independence and find Basis
$S = \{110, 011, 101, 111\}$.

b) Find a generator matrix for the code $C = \{0000, 1110, 0111\}$ by using the REF.

UNIT – III

13. a) Compute the upper bound for the size or dimension k of a linear code C of length $n=6$ and distance $d=3$?

b) Let $n=23$ with $t=3$ show that it is a linear perfect code?

(OR)

14. a) Explain the Hamming Code. Find the generator matrix in standard form for a Hamming code of length 15, then encode the message 11111100000?

b) Explain for Algorithm of IMLD for C_{24}? Also decode w=101111101111, 010010010010?

UNIT – IV

15. a) Write out the Hamming code of length 7 generated by the matrix G and then represent this code by polynomials.

$$G = \begin{bmatrix} 1000111 \\ 0100110 \\ 0010101 \\ 0001011 \end{bmatrix}$$

b) Define Cyclic Code. Find the generator polynomial for the smallest linear cyclic code containing that word. 010101.

(OR)

16. a) Let C be the linear cyclic code of length $n=7$ with generator polynomial $g(x)= 1+x+x^3$ of degree $n-k=3$. Find a basis for C ?

b) For $n=6$, Factor $1+x^6$ into irreducible factors $1+x^6 = (1+x^3)^2 = (1+x)^2(1+x+x^2)^2$ then find the generators of proper cyclic codes of length 6?

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M.Sc. DEGREE, EXAMINATIONS
FOURTH SEMESTER
BRANCH:-MATHEMATICS
MAT 402: SDC- II: INTRODUCTORY METHODS OF NUMERICAL ANALYSIS

Time: 3 Hours　　　　　　　　　　　　　　　　　　　　　　Max. Marks: 70

SECTION-A　　　　　　　　　　　　　　4X5=20

Answer any **FOUR** questions. **All** questions carry equal marks.

1. What is the importance of Predictor-Corrector Methods?
2. Explain boundary -value problems
3. Classify the P.D.Es and what type of problems arise in the study of P.D.Es?
4. Explain SOR method
5. Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subject to the initial condition u=sinπx at t=0 for $0 \leq x \leq 1$ and the boundary conditions u=0 at x=0 at x=1 for t>0 . Take h=0.2, $\lambda = 1$ and compute the values of u at the internal mesh point up to two time steps.
6. Explain Crank – Nicolson method
7. Find the functions for the boundary- value problem defined by $\frac{d^2y}{dx^2}$= f(x) and y(a)=y(b)=0
8. Discuss two Methods of approximation.

SECTION- B　　　　　　　　　　　　　　4X12.5=50

Answer All questions. Each question carries 12.5 Marks.

UNIT-I

9. Given $\frac{dy}{dx} = 1 + y^2$, where $y = 0, when\ x = 0$, compute $y(0.8)$

(OR)

10. Given the Boundary Value problem $x^2y'' + xy' - y = 0, y(1) = 1, y(2) = 0.5$. Determine the value of y(1.5) by applying cubic spline method.

UNIT-II

11. Solve the equation $u_{xx} + u_{yy} = 0$ in the domain of following figure by
    a) Jacobi's Method
    b) Gauss- Seidel Method

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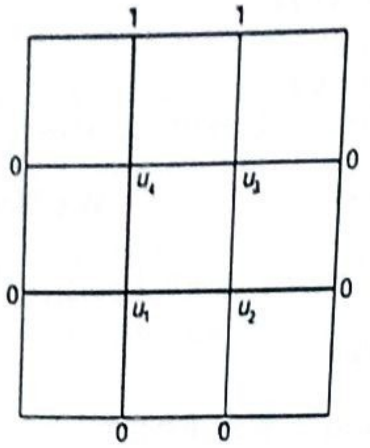
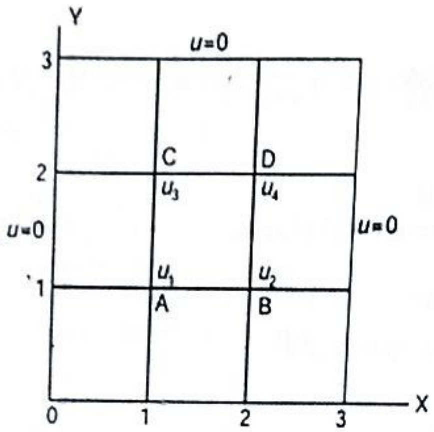


(OR)

12. Solve the Poisson equation $u_{xx} + u_{yy} = -10(x^2 + y^2 + 10)$ in the domain of following figure



UNIT-III

13. Use the Bender-Schmidt recurrence relation to solve the equation $\frac{\partial^2 u}{\partial x^2} = 2\frac{\partial u}{\partial t}$ with conditions $u(x,0) = 4x - x^2,\ u(0,\ t) = u(4,\ t) = 0$

(OR)

14. Solve the Heat equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial^2 x}$ subject to conditions $u(x,\ 0) = 0,\ u(0,\ t) = 0, u(1,\ t) = t$

UNIT-IV

15. Find the functional for the boundary -value problem defined by $\frac{\partial^2 y}{\partial^2 x} = f(x) and$ $y(a) = y(b) = 0$

(OR)

16. Solve the boundary- value problem defined $y'' + y = -x\ , 0 < x < 1, with\ y(0) = y(1) = 0$

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M.Sc DEGREE EXAMINATION
FOURTH SEMESTER
BRANCH:- Applied Mathematics
AMA 401: SDC-I: CONTINUM MECHANICS

Marks: 70

Time: 3hours

SECTION – A

Answer any FOUR questions. All questions carry equal marks.

(Marks : $4 \times 5 = 20$)

1. Define stream lines. Determine the equation of stream lines if $\overline{q} = x\overline{i} - y\overline{j}$.

2. For an incompressible fluid $q = (wy, wx, o)$ Discuss the Nature of the flow.

3. Derive the condition at a boundary of two inviscid immiscible Fluids?

4. Explain pitot tube.

5. Explain Stoke's Stream function.

6. Obtain stream function ψ for a uniform line source along $\overline{oz}$.

7. Discuss the flow due to a uniform line doublet at 'o' of strength μ per unit length Its axis being along $\overline{ox}$.

8. Discuss the uniform flow past a fixed infinite circular cylinder.

SECTION – B

Answer ALL questions. All questions carry equal marks.

(Marks: 4 ×12.5=60)

9. (a) Derive the equation of Continuity.

   (b) At the point in an incompressible fluid having spherical polar co-ordinates (r, θ, ψ) the velocity components are $(2Mr^{-3}\cos\theta, Mr^{-3}\sin\theta, o)$ where M is a constant show that the velocity is of the potential kind. Find the velocity potential and the equations of the streamlines.

Or

10. (a) Explain the conditions at rigid boundary.

    (b) Discuss general analysis of fluid motions.

[P.T.O.]

11. (a) Prove that the pressure at 'p' in moving inviscid fluid is independent of the orientation of 'δA'.

(b) Discuss Bernoulli's equation.

Or

12. (a) Discuss the case of steady motion under conservation body forces

(b) Explain ventury tube?

13. (a) If $r^n S_n(\theta, \psi)$ is a Harmonic function, then prove that $r^{-(n+1)} S_n(\theta, \psi)$ is also Harmonic function.

(b) Discuss doublet is a uniform stream.

Or

14. State and prove Weiss's sphere theorem.

15. (a) Discuss the flow for which $W = z^2$.

(b) State and prove the Milne – Thomson circle theorem.

Or

16. State and prove Blasius theorem.

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