**Course File**

***Subject Title/Subject Code:***

***Advanced Engineering Mathematics II/4EC2-01***

Semester: IV Year 2023-24

|  |  |
| --- | --- |
| Name of the Faculty: Dr. Kalpana Fatawat |  |
|  |  |
| E-mail id: [kalpana.fatawat@technonjr.org](mailto:kalpana.fatawat@technonjr.org) |  |

**Class Schedule**

**Total Number of Lectures:** 40

i**)Course Objective**

By learning this course, students will be able to understand the complex variable, to identify analytic functions, to understand complex integration, and applications of integration. It will be helpful in identifying curves and regions in the complex plane defined by simple expressions.

Further, the study of special functions and linear algebra are importance in solving science and engineering problems. Students will be able to formulate and analyze the signal problems and to provide solutions.

**INDEX - COURSE FILE**

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**VISION & MISSION OF INSTITUTE**

## Vision

**Empowering student with recent and emerging technologies to create innovative technical leaders**

**capable of contributing to industrial and societal needs for betterment of mankind across the globe.**

## Mission

**M1: To provide dynamic learning environment to students by providing constant exposure to latest technologies by linking closely with the industries.**

**M2: To establish effective interface with industry to obtain live problems to enhance critical thinking and problem solving skills among students and consultancy projects for faculty.**

**M3: To provide avenues and opportunities to faculty for domain specific trainings and qualification upgradation.**

**M4: To develop ethical leaders with strong communication skills.**

**VISION & MISSION OF DEPARTMENT**

**Department Vision**

To increase students’ learning of fundamentals of programming and latest technologies of IOT through industry-aligned project-based learning transforming students to be good Embedded and IT Professionals leading to innovation and incubation of new ideas.

**Department Mission**

M1: To create experimental learning through solving problems of Government, Society, Smart Cities, Industry and other entities.

M2: To teach the latest technologies of IOT and Programming Skills to the students as beyond the syllabus activity so that they are updated and industry ready.

M3: To enable engineering students understand industry-aligned technologies and learn to find solutions from their early engineering days and this is the only way to produce globally relevant engineers solving real-life problems applying current technologies.

M4: To enable students to generate projects through problem faced by and requirement of Smart cities, industry, Government and other entities whereby those outlined problem statements are to be studied deeply by a group of faculty members to convert them into real-time project format.

**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)**

**Core Knowledge Development:** Be competent in applying electronics and communication engineering principles to develop socially and environmentally acceptable engineering solutions.

**Professional development:** Have fulfilling career in electronic and communication engineering or associated industries or higher education and research, or as entrepreneurs.

**Attitude towards lifelong learning:** Enhance the ability and attitude to adapt to evolving technological and social challenges.

**PROGRAM SPECIFIC OUTCOMES (PSO's)**

PSO1: To be aware of and initiate some work on programming and new developments which may impact future embedded and IT industry jobs.

PSO2: Design and development of Embedded and IOT based systems.

PSO3: Get exposure to Embedded and IT Industry work culture.

**PROGRAMME OUTCOMES (POs)**

**Engineering Graduates will be able to:**

**PO01. Engineering knowledge:** Acquire the knowledge of mathematics, science, engineering fundamentals, and electronics and communication engineering, with an ability to understand, analyze and apply to the solution of engineering problems.

**PO02. Problem analysis:**Identify, formulate, research literature, analyse and solve electronics and communication engineering problems.

**PO03. Design/development of solutions:**Design solutions for electronics and communication engineering problems with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO04. Conduct investigations of complex problems:**Design and conduct experiments, analyse and interpret data, and synthesize information to provide valid conclusions.

**PO05. Modern tool usage:**Apply appropriate techniques, resources, and modern hardware and software engineering tools to solve electronics and communication engineering problems.

**PO06. The engineer and society:**Apply reasoning to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO07. Environment and sustainability:** Demonstrate the understanding of the impact of the professional engineering solutions in societal and environmental contexts, and need for sustainable development.

**PO08. Ethics:** Demonstrate the knowledge of professional and ethical responsibilities.

**PO09. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO10.Communication:** Comprehend and communicate confidently and effectively in both verbal and written form.

**PO11. Project management and finance:**Apply the engineering and management principles for efficient project management.

**PO12. Life-long learning:** Recognize the need and acquire confidence for independent and life-long learning.

**COURSE OUTCOMES (COs) OF THE SUBJECT**

|  |  |  |
| --- | --- | --- |
| CO No. | Mapping | Statement |
| 1 | Understanding | Gain knowledge about basic concepts of complex analysis and understand how The rotation of a point in complex plane occurs. Further, learn how to map the points from one space to another one. |
| 2 | Understanding | Able to understand singularity, poles and region of convergence that can be apply to solve the circuit problems. The knowledge of Taylor series and Laurent series is applied to obtain analytical part of a function and identifications of singularities respectively. |
| 3 | Applying | Evaluating definite and indefinite integrals. |
| 4 | Applying | Students will be able to analyze the electronics problem like frequency modulation, transmission lines, and telephone equations with the help of Bessel function. |
| 5 | Understanding | The study of linear algebra enables student to solve many circuits problem and in communication section it is used in the form of image processing which is used now a days a lot. |

**COS MAPPING WITH POs AND PSOs**

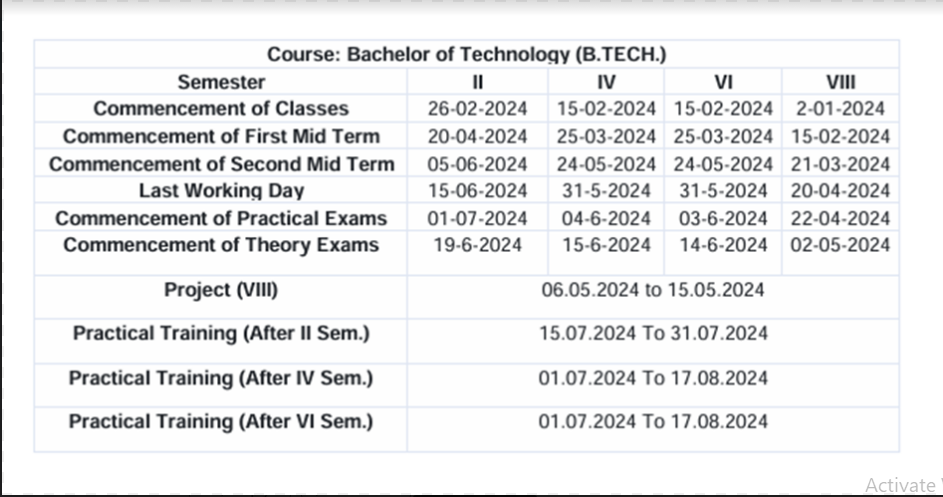
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Outcome** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
| **CO1** | 2 | 2 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| **CO2** | 2 | 2 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| **CO3** | 2 | 2 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| **CO4** | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| **CO5** | 2 | 2 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

**Mapping Justification:**

|  |  |
| --- | --- |
| PO1 | The study of complex variables and functions is important in finding the real convergence space, that’s why CO1 is moderately mapped with PO1. |
| PO2 | The formulation electronics requires analysis of frequency modulation which is based on complex studies, so CO1 is moderately applied with PO2. |
| PO4 | Ability to identify and solve problems based on either reactive management or proactive management and capable to perform multidisciplinary tasks. |
| PO12 | It is expected that this learning may useful in higher studies when one has to deal with the real life problem. For example, to compute the potential difference across two AC power supplies with respect to time. That’s why CO1 is mapped with PO12. |
| PSO1 | The advance mathematics is applied to formulate, design and investigation of complex problem of signals and circuits. Hence, CO1 is mapped with PSO1. |
| PSO2 | The analytical study of complex variables is applied in electronics project to meet he demands of industries and to provided solution to the current real time problems. |

Likewise, the CO-2, CO-3, CO-4 and CO-5 can easily be mapped to each of the PO-1, PO-2, PO-4, PO-12, PSO1 and PSO2.

**UNIVERSITY ACADEMIC CALENDAR**



**Evaluation Scheme**

FACULTY DETAILS:

Name of the Faculty : Dr. Kalpana Fatawat

Designation : Associate Professor

Department :

1. TARGET

a) Percentage Pass : 100%

b) Percentage I class: 50 %

2. METHOD OF EVALUATION

2.1. Continuous Assessment Examinations (Mid-Term 1, Mid-Term 2)

2.2. Assignments

2.3. Quiz

2.5. Semester Examination Others\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. List out any new topic(s) or any innovation you would like to introduce in teaching the subject in this Semester.

1. Take the help of creative tools to stimulate creativity. Include demonstration or forms of visual exercises that will excite the young minds and capture their interest.

Signature of Faculty: **Signature of HOD**

**UNIVERSITY SYLLABUS**

**4EC2-01: Advance Engineering Mathematics-II**

**Credit: 3 Max. Marks: 150(IA:30, ETE:120)**

**3L+0T+0P End Term Exam: 3 Hours**

|  |  |  |
| --- | --- | --- |
| **S N** | **Contents** | **Hour s** |
| **1** | **Introduction:** Objective, scope and outcome of the course. | **1** |
| **2** | **Complex Variable – Differentiation:** Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties. | **7** |
| **3** | **Complex Variable - Integration:** Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville’s theorem and Maximum- Modulus theorem (without proof); Taylor’s series, zeros of analytic functions, singularities, Laurent’s series; Residues, Cauchy Residue theorem (without  proof). | **8** |
| **4** | **Applications of complex integration by residues:** Evaluation of definite integral involving sine and cosine. Evaluation of certain improper integrals. | **4** |
| **5** | **Special Functions:** Legendre’s function, Rodrigues formula, generating function, Simple recurrence relations, orthogonal property.  Bessel’s functions of first and second kind, generating function, simple recurrence relations, orthogonal property. | **10** |
| **6** | **Linear Algebra:** Vector Spaces, subspaces, Linear independence, basis and dimension, Inner product spaces, Orthogonality, Gram Schmidt orthogonalization, characteristic polynomial, minimal polynomial, positive definite matrices and canonical forms, QR decomposition. | **10** |
| **Total** | | **40** |

**PRESCRIBED BOOKS**

1. Advanced Engineering Mathematics, Erwin and Kreyszig, Wiley-India
2. Advanced Engineering Mathematics-1, Dr. Gokhroo and Dr. Jain, Unique books.

# Teaching and Learning resources unit-wise:

Unit 1

## <https://www.youtube.com/watch?v=FL6thjKSR58&list=PLNKx0RorxX44HBsItvZP5CzFX1qCQOwp5>

**Analytic function**

<https://www.youtube.com/watch?v=rooMFBHoF5E\>

**Milne-thomson method.**

<https://www.lnjpitchapra.in/wp-content/uploads/2020/04/file_5ea29c892ab54.pdf\>

Mobious transformation

<https://www.youtube.com/watch?v=qjpLIlVo_6E>

application of linear transformation:

<https://www.youtube.com/watch?v=5RoPKr94_-w>

## Unit 2

Contour integral

<https://www.youtube.com/watch?v=cVCd9dnttfw>

Laurent series

<https://www.youtube.com/watch?v=zFncaqiXgr4>

Taylor series

<https://www.youtube.com/watch?v=nGtKMqdaiYw>

residue calculation

<https://www.youtube.com/watch?v=hsBfQMEQb-A>

singularity

<https://www.youtube.com/watch?v=rc8Y0rRU-Bg>

## Unit 3

Evaluation of definite integral

<https://www.youtube.com/watch?v=z-Hr6uTkxF0> (using real and imaginary part)

## <https://www.youtube.com/watch?v=OSGwncLR-7c>

Evaluation of indefinite integral

<https://www.youtube.com/watch?v=qj6fd4yDK-g>

## Unit 4

Bessel function

<https://www.youtube.com/watch?v=6n5QyYMe9U0>

Legendre function and Rodrige formula

<https://www.youtube.com/watch?v=AluwhdfHT7w>

generating function of Legendre function

<https://www.youtube.com/watch?v=XhjlY1wUW8I>

## Unit 5

## Vector space and subspace

## <https://www.google.com/search?q=vector+space+and+subspace+NPTEL%0D%0A&ei=_8CCZJ2sFLrm2roPysqOwAw&ved=0ahUKEwjdp6CrwrX_AhU6s1YBHUqlA8gQ4dUDCBE&uact=5&oq=vector+space+and+subspace+NPTEL%0D%0A&gs_lcp=Cgxnd3Mtd2l6LXNlcnAQAzIFCCEQoAEyBQghEKABOgoIABBHENYEELADOgoIABCKBRCwAxBDOgUIABCABDoGCAAQFhAeOggIABCKBRCGAzoHCCEQoAEQCjoHCAAQDRCABEoECEEYAFDYBVicJ2DJTGgBcAF4AIAB2AKIAeUJkgEHMC40LjEuMZgBAKABAcABAcgBCg&sclient=gws-wiz-serp#fpstate=ive&vld=cid:7e091bf2,vid:2DX8Vp1Q2-0>

## Cannonical form of matrix

## <https://www.youtube.com/watch?v=IAx3IYxR2nI>

## QR decomposition

## <https://www.youtube.com/watch?v=n3zN2hZCul4>

## important revision material link:

<https://classroom.google.com/c/NjA2OTU2MTM5NDI1?cjc=qvxoiac>

**WEEKLY TIME TABLE OF THE TEACHER**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Day** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| Monday |  | AEM |  |  |  |  |  |
| Tuesday |  | AEM |  |  |  |  |  |
| Wednesday |  | AEM |  |  |  |  |  |
| Thursday | AEM |  |  |  |  |  |  |
| Friday |  |  |  |  |  |  |  |
| Saturday |  |  |  |  |  |  |  |

**COURSE-PLAN**

|  |  |  |  |
| --- | --- | --- | --- |
| UNIT | Lect.  No. | TOPICS | **Teaching Methods/ Teaching Aids** |
| 1 | **1** | **INTRODUCTION:** Objective, scope and outcome of the course. | White Board, Demonstration |
|  | 2 | **COMPLEX VARIABLE – DIFFERENTIATION: INTRODUCTION & DIFFERENTIATION** | White Board, Demonstration |
|  | 3 | Cauchy-Riemann equations. | White Board |
|  | 4 | Analytic functions & harmonic functions | White Board |
|  | 5 | Finding harmonic conjugate | White Board |
|  | 6 | Elementary analytic functions (exponential, trigonometric, logarit.) & their properties | White Board |
|  | 7 | Conformal mappings, Mobius transformations and their properties | White Board |
|  | 8 | Mobius transformations and their properties | White Board |
| 2 | 9 | **COMPLEX VARIABLE - INTEGRATION: INTRODUCTION** | White Board |
|  | 10 | Contour integrals | White Board |
|  | 11 | Cauchy-Goursat theorem (without proof) & Cauchy Integral formula (without proof). | White Board |
|  | 12 | Liouville’s theorem and Maximum-Modulus theorem (without proof). | White Board |
|  | 13 | Taylor’s series, zeros of analytic functions, singularities, | White Board |
|  | 14 | Laurent’s series | White Board |
|  | 15 | Residues, Cauchy Residue theorem (without proof). | White Board |
| 3 | 16 | **APPLICATIONS OF COMPLEX INTEGRATION BY RESIDUES: INTRODUCTION** | White Board |
|  | 17 | Evaluation of definite integral involving sine and cosine. | White Board |
|  | 18 | Evaluation of definite integral involving sine and cosine. | White Board |
|  | 19 | Evaluation of certain improper integrals | White Board |
|  | 20 | Discussion & Revision of Unit 4 | White Board |
| 4 | 21 | **SPECIAL FUNCTIONS: INTRODUCTION** | White Board |
|  | 22 | Legendre’s function | White Board |
|  | 23 | Rodrigues formula | White Board |
|  | 24 | Legendre’s function Generating function. | White Board |
|  | **25** | Simple recurrence relations | White Board |
|  | 26 | Orthogonal property. | White Board |
|  | 27 | Bessel’s functions of first and second kind | White Board |
|  | 28 | Bessel’s function generating function | White Board |
|  | 29 | Bessel’s function simple recurrence relations. | White Board |
|  | 30 | Bessel’s function orthogonal property. | White Board |
| 5 | **31** | **LINEAR ALGEBRA: INTRODUCTION** | White Board |
|  | 32 | Vector Spaces, subspaces & Linear independence | White Board |
|  | 33 | Vector Spaces, subspaces & Linear independence | White Board |
|  | 34 | Basis and dimensions. | White Board |
|  | 35 | Inner product spaces & Orthogonality | White Board |
|  | 36 | Gram Schmidt orthogonalization | White Board |
|  | 37 | Characteristic polynomial & minimal polynomial | White Board |
|  | 38 | Positive definite matrices and canonical forms | White Board |
|  | 39 | Positive definite matrices and canonical forms | White Board |
|  | 40 | QR decomposition | White Board |

**Signature of Faculty: Signature of HOD**

# TECHNO INDIA NJR INSTITUTE OF TECHNOLOGY

# B. TECH II – YEAR (IV SEM.)

# Electronics & communication Engineering

Advanced Engineering Mathematics II

**Assignment – 1**

what value of k will F(z) satisfy the Cauchy-Riemann equations?

1. Show that the following function is analytical and find its derivative.
2. Verify Cauchy’s theorem for the function , if C is the circle

3. Evaluate the integral where C is a circle

4. Expand and sinz in Taylor’s series about z=0 .

5. Expand the following functions in a Laurent’s series:

6. Find the kind of singularity of the function at the points z=a and infinity.

1. Evaluate the residues of

at 1, 2, 3 and infinity and show that their sum is zero.

1. If

f(z)=u+iv is an analytical function of z=x+iy then find f(z) in terms of z.

1. Find the bilinear transformation which transforms z=2,i,-2 into the point w=1,i,-1.
2. Evaluate:

# TECHNO INDIA NJR INSTITUTE OF TECHNOLOGY

# B. TECH II – YEAR (IV SEM.)

# Electronics & communication Engineering

Advanced Engineering Mathematics II

Assignment 2

1. State and prove generating function for Bessel function.
2. Prove the following:

a.

b.

c.

d.

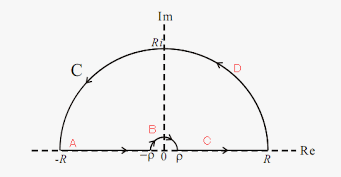
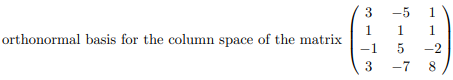
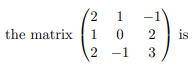
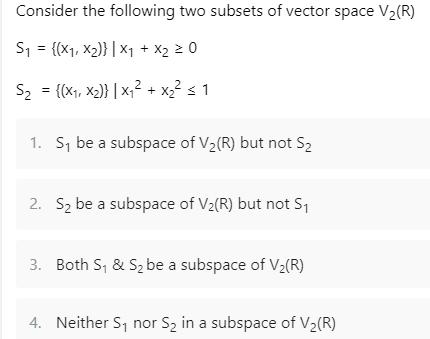
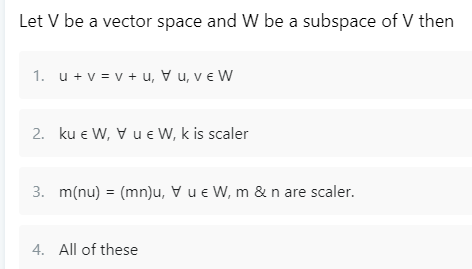
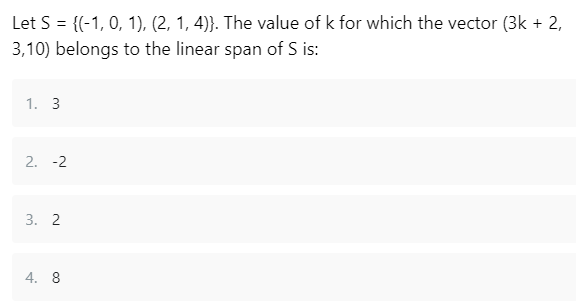
e.

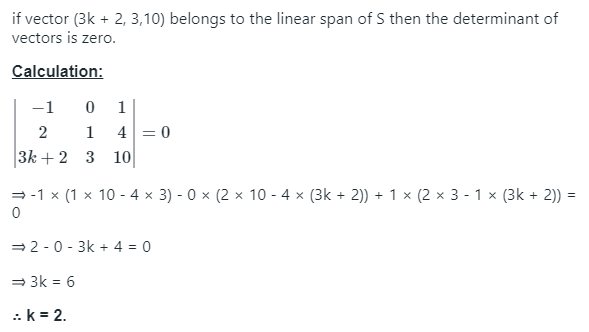
1. State and prove generating function for Legendre function.
2. State and prove Rodrige formula.
3. Show that
4. Define Vector space and subspace.
5. Explain linear dependence and independence.
6. Explain the term orthogonality for vectors.
7. Find the minimal polynomial for the following matrix:

1. Apply Gram-schmidt orthogonalization process to the following vectors to obtain an orthonormal basis for R(3) with the standard inner product defined on it:

B(1)=(1,1,1), B(2)=(0,1,1),B(3)=(0,0,1)

**QUIZ**

1. Laurent expansion of z\(z+1)(z+2) about the singularity z=−2 is.
2. **1+(z+2)+…..**
3. 1+2z+………
4. 1+2(z+2)+….
5. Z+z\(z+1)+….
6. Limit of the function :
7. Unique
8. Different at different point
9. 1\2 at
10. **All of the above**
11. the integration of a function at inner contour is :
12. Depends on radius of contour.
13. Depends on R
14. **0**
15. none
16. The residue for at z=-1:
17. 1
18. **-2/e**
19. -1/2
20. 0
21. Generating function of Bessel function is :
22. None
23. The values of :
24. X and 1
25. 1 and -1
26. Both 0
27. **1 and x**
28. Cauchy’s Riemann equations are :
29. u(x)=v(y) and u(y)=-v(x)
30. u(x)=-v(y) and u(y)=-v(x)
31. u(x)=-v(y) and u(y)=v(x)
32. all are equivalent.
33. A point at which function is ceases to be analytical is called:
34. Non singular point
35. Regular point
36. **Singular point**
37. Non-regular point
38. The fixed points of are
39. **i,-i**
40. 1,-1
41. 0.-1
42. -1,0
43. What are the poles and zeros of a transfer function:
44. **The frequencies for which the value of the denominator and numerator of transfer function becomes infinite and zero.**
45. The frequencies for which the value of the numerator and denominator of transfer function becomes infinite and zero.
46. the frequencies for which the value of the denominator and numerator of transfer function becomes infinite and zero.
47. none
48. what is true about poles and singularity:
49. poles can be removed not singularity.
50. **Singularity can be removed not pole.**
51. Both can be removed.
52. none
53. 
54. ****
55. 
56. Both
57. None ans (a)
58. 
59. (1,2,3,4), (1,0,-1,0),(0,0,-2,2)
60. In a diagonal matrix:
61. All diagonal elements are 0.
62. All upper triangular elements are 0
63. All the elements except diagonal are 0
64. **All the elements except principal diagonal are 0.**
65. 
66. Singular
67. Non-singular
68. Diagonal
69. Positive definite
70. The characteristic equation of the matrix is:
71. (x-8)(x-8)(x-2)
72. (x-2)(x-8)(x-3)
73. (x-2)(x-2)(x-8)
74. None
75.  ans (4)
76. ans (4)
77. Which is true:
78. **dim(u+v)=dim u+dim v – dim(u^v)**
79. dim(uv)=dim u+dim v – dim(u^v)
80. D(u+v)=dim u+dim v – dim(u-v)
81. D(u+v)=dim u-dim v – dim(u^v)
82. 



# TECHNO INDIA NJR INSTITUTE OF TECHNOLOGY

# B. TECH II – YEAR (IV SEM.)

# Electronics & communication Engineering

4EC201-Advanced Engineering Mathematics-II

Mid Term I

## Max Marks: 70 Time:3 Hrs

Note:1) The paper is divided into 2 parts: Part-A and, Part-B  
2) Part-A contains 10 questions and carries 2 marks each.  
3) Part B contains 5 questions. Each question is having two options and carries 10 marks each.

## PART – A

|  |  |  |
| --- | --- | --- |
|  | What are the critical points for a complex function w=f(z). Hence find the critical points for w=e^{z} | [CO1] |
|  | Write the C-R equations. | [CO1] |
|  | What do you mean by linear transformation. | [CO1] |
|  | Find the points where w=z+1\z is not conformal. | [CO1] |
|  | Evaluate where A=(1,1), B=(2,4) along straight line AB. | [CO2] |
|  | Write the statements of Cauchy Integral theorem and Cauchy’s Goursat’s theorem. | [CO2} |
|  | Explain removable singularity. Show that | [CO2] |
|  | Verify Cauchy’s theorem for , |z-1|=2 | [CO2] |
|  | Evaluate | [CO3] |
|  | Write the poles for the following equation | [CO3] |

**PART – B**

|  |  |  |
| --- | --- | --- |
|  | , z is not zero, otherwise f(0)=0, examine the nature of f(z) in region including the origin. | [CO1] |
| **OR** | | |
|  | , Check whether u is harmonic and also find its conjugate . | [CO1] |

|  |  |  |
| --- | --- | --- |
|  | Write Thomas-Mline theorem and find f(z) if is given. | [CO1] |
| **OR** | | |
|  | Find the bilinear transformation which maps the points z=1,i,-1 respectively onto the points w=I,0,-i for this transformation find the image of (i) |z|=1 and (ii) |z|=r | [CO1] |

|  |  |  |
| --- | --- | --- |
|  | Evaluate | [CO2] |
| **OR** | | |
|  | Obtain the expansion of cos z and sin z using Taylor’s theorem. | [CO2] |

|  |  |  |
| --- | --- | --- |
|  | Obtain the expansion for which is valid, for (a) |z|<1 (b) 1<|z|<4 (c) |z|>4 | [CO2] |
| **OR** | | |
|  | State and prove Taylor theorem. | [CO2] |

|  |  |  |
| --- | --- | --- |
|  | Show that , 0<a<1 | [CO3] |
| **OR** | | |
|  | Show that | [CO3] |

------------------------------------------------------------- **All the Best** -------------------------------------------------------------

**Marks and Gap Analysis of Mid-Term 1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sr. No | RTU Roll Number | Name of the Student | M-1 Marks (70) | Remark ( Remedial Class need or not – Y/N ) |
| 1 | 22ETCEC001 | AZIZ BOHRA | 58 | N |
| 2 | 22ETCEC002 | GAURAV SHARMA | 65 | N |
| 3 | 22ETCEC005 | MSKRITIKA SAINI | 54 | N |
| 4 | 22ETCEC006 | LAKSHYA BHAVSAR | 51 | N |
| 5 | 22ETCEC007 | NILESH SUTHAR | 47 | Y |
| 6 | 22ETCEC008 | PIYUSH CHORDIYA | 47 | Y |
| 7 | 22ETCEC009 | PLAKSHA PRIYA | 63 | N |
| 8 | 22ETCEC010 | MS. VAISHALI PUJARI | 61 | N |
| 9 | 22ETCEC011 | MSVIDHI SONI | 68 | N |
| 10 | 22ETCEC012 | VINAYAK MEGHWAL | 63 | N |
| 11 | 22ETCEC013 | VIPIN JAIN | 56 | N |
| 12 | 22ETCEC014 | VISHNU SUTHAR | 56 | N |
| 13 | 22ETCEC015 | VISHWAS PRAJAPAT | 70 | N |

**Signature of Faculty: Signature of HOD**

**Remedial Action Taken to Remove the Gaps (After Mid- Term 1)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| S.no. | University Roll no. | Name of Student | Topics to be discussed in Remedial Class | Schedule Date of Remedial Class | Outcome  Achieved |
|  | 22ETCEC007 | NILESH SUTHAR | Complex integral |  | Able to solve the questions |
|  | 22ETCEC008 | PIYUSH CHORDIYA |

**Signature of Faculty: Signature of HOD**

# TECHNO INDIA NJR INSTITUTE OF TECHNOLOGY

# B. TECH II – YEAR (IV SEM.)

# Electronics & Engineering

4EC201- Advanced Engineering Mathematics-II

Mid Term II

## Max Marks: 70 Time: 3 Hrs

Note:1) The paper is divided into 2 parts: Part-A and, Part-B  
2) Part-A contains 10 questions and carries 2 mark each.  
3) Part-B contains 5 questions. Each question is having two options and carries 10 marks each.

## PART – A

|  |  |  |
| --- | --- | --- |
|  |  | [CO5] |
|  | Explain orthonormal basis. | [CO5] |
|  | Write the recurrence formula for Bessel function. | [CO4] |
|  | Write the recurrence relation for Legendre function. | [CO4] |
|  | What are the steps to evaluate the integral of the type | [CO3] |
|  |  | [CO3] |
|  | Write the Bessel function of first and second kind. | [CO4] |
|  | Prove that: | [CO4] |
|  | What do you understand by norm of a vector. Define orthogonality of vectors. | [CO5] |
|  | Check whether the following vectors are LD: (1,3,2),(1,-7,-8),(2,1,-1) | [CO5] |

**PART – B**

|  |  |  |
| --- | --- | --- |
|  | Evaluate: | [CO3] |
| **OR** | | |
|  | Show that: | [CO3] |

|  |  |  |
| --- | --- | --- |
|  | Prove the recurrence relation for Bessel function. | [CO4] |
| **OR** | | |
|  | Prove that : | [CO4] |

|  |  |  |
| --- | --- | --- |
|  | Prove the following recurrence relations (i)  (ii) | [CO4] |
| **OR** | | |
|  | State and prove orthogonality of Bessel function. | [CO4] |

|  |  |  |
| --- | --- | --- |
|  | Define vector subspace and prove that the intersection of two subspaces is also a subspace. | [CO5] |
| **OR** | | |
|  | Explain the linear dependence and independence with example. Also explain Norm of a vector. | [CO5] |

|  |  |  |
| --- | --- | --- |
|  | Find the characteristic polynomial of the following matrix:  and also show that if it is positive definite. | [CO5] |
| **OR** | | |
|  | Perform QR decomposition for the following vectors: a=(1,0,1), b=(1,0,-1) and c=(0,3,4). | [CO5] |

**Mid Term Exam – II**

**Marks and Gap Analysis of Mid-Term II**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sr. No | RTU Roll Number | Name of the Student | M-1 Marks (70) | Remark ( Remedial Class need or not – Y/N ) |
| 1 | 22ETCEC001 | AZIZ BOHRA | 51 | N |
| 2 | 22ETCEC002 | GAURAV SHARMA | 65 | N |
| 3 | 22ETCEC005 | MSKRITIKA SAINI | 58 | N |
| 4 | 22ETCEC006 | LAKSHYA BHAVSAR | 58 | N |
| 5 | 22ETCEC007 | NILESH SUTHAR | 47 | Y |
| 6 | 22ETCEC008 | PIYUSH CHORDIYA | 56 | N |
| 7 | 22ETCEC009 | PLAKSHA PRIYA | 51 | N |
| 8 | 22ETCEC010 | MS. VAISHALI PUJARI | 63 | N |
| 9 | 22ETCEC011 | MSVIDHI SONI | 68 | N |
| 10 | 22ETCEC012 | VINAYAK MEGHWAL | 58 | N |
| 11 | 22ETCEC013 | VIPIN JAIN | 51 | N |
| 12 | 22ETCEC014 | VISHNU SUTHAR | 61 | N |
| 13 | 22ETCEC015 | VISHWAS PRAJAPAT | 70 | N |

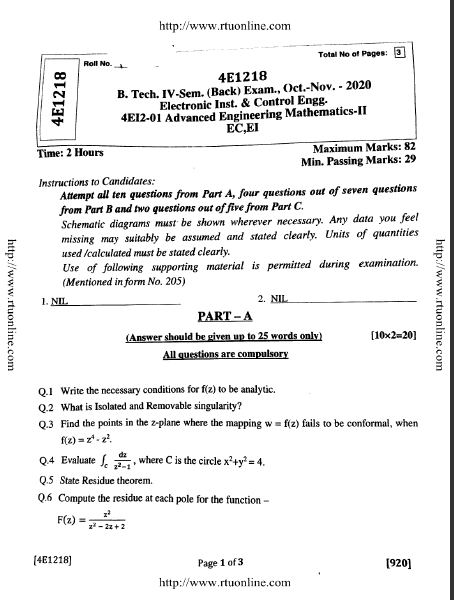
**Signature of Faculty: Signature of HOD**

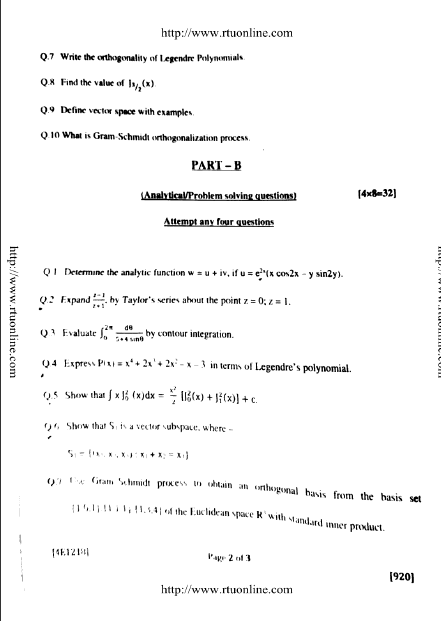
**Remedial Action Taken to Remove the Gaps (After Mid- Term 1)**

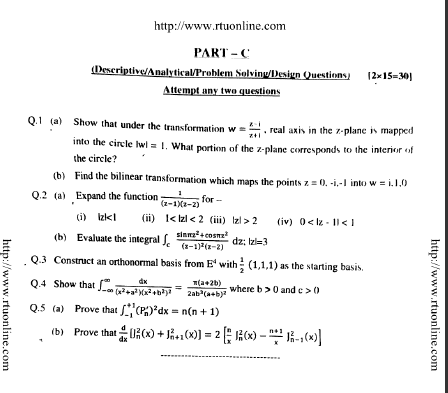
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| S.no. | University Roll no. | Name of Student | Topics to be discussed in Remedial Class | Schedule Date of Remedial Class | Outcome  Achieved |
|  | 22ETCEC007 | NILESH SUTHAR | Vector space and complex integral , dependence and independent of vectors, PYQ |  | Able to solve the PYQ |

**Signature of Faculty: Signature of HOD**

**Model Question Paper**







**RESULT ANALYSIS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S.NO.** | **RTU ROLL NUMBER** | **NAME OF STUDENT** | **END TERM MARKS** | **SESSIONAL MARKS** | **TOTAL** |
| **MAX MARKS** | **70** | **30** | **100** |
|  | 22ETCEC001 | AZIZ BOHRA |  | 25 |  |
|  | 22ETCEC002 | GAURAV SHARMA |  | 28 |  |
|  | 22ETCEC005 | MSKRITIKA SAINI |  | 23 |  |
|  | 22ETCEC006 | LAKSHYA BHAVSAR |  | 24 |  |
|  | 22ETCEC007 | NILESH SUTHAR |  | 24 |  |
|  | 22ETCEC008 | PIYUSH CHORDIYA |  | 25 |  |
|  | 22ETCEC009 | PLAKSHA PRIYA |  | 26 |  |
|  | 22ETCEC010 | MS. VAISHALI PUJARI |  | 24 |  |
|  | 22ETCEC011 | MSVIDHI SONI |  | 29 |  |
|  | 22ETCEC012 | VINAYAK MEGHWAL |  | 27 |  |
|  | 22ETCEC013 | VIPIN JAIN |  | 27 |  |
|  | 22ETCEC014 | VISHNU SUTHAR |  | 25 |  |
|  | 22ETCEC015 | VISHWAS PRAJAPAT |  | 30 |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| TOTAL | PASS | FAIL | ABSENT | PASS % |
|  |  |  |  |  |

**Indirect Assessment:**

**Overall Teacher Self Assessment (at the completion of course) in terms of course objective and outcomes**

At the completion of course I find that the set outcomes (see course outcome table) were achieved at the satisfactory level.

**Methodology to identify bright student**

I follow very simple techniques of observation and interaction. I observe the intellectual level of the students by asking simple questions which are basics of the mathematics and interact with them regularly. I Pay attention to each and every students to know how they are utilizing their brain to perform the different tasks or activities.

**Efforts to keep students engaged**

I start my lecture by asking school level problems and move towards the topic to be taught. In between I ask short questions to which they can answer by looking at their notes, so that they can remember. One problem I solve with the help of the students and at the end I conduct MCQ. If I am continuing topic taught in previous class, I start with making students recalling it and ask MCQ questions.