Techno India NJR Institute of Technology

Course File

ENGINEERING MATHEMATICS-I

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For Techno India NJR Institute of Technology
पंकज पोरवाल
Dr. Pankaj Kumar Porwal
(Principal)

TECHNO INDIA NJR INSTITUTE OF TECHNOLOGY

Approved by AICTE & Affiliated to Rajasthan Technical University

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Notice: Academic Calendar 2021-2022

Date: 15/09/2021

RAJASTHAN TECHNICAL UNIVERSITY KOTA

Academic Calendar for Odd Semester for Session 2021-22

Course: Bachelor of Technology (B.TECH.)

Semester	I	III	V	VII
Induction Program	*			
Commencement of Classes	*	20.09.2021	20.09.2021	01.09.2021
Commencement of First Mid Term	*	28.10.2021	25.10.2021	04.10.2021
Commencement of Second Mid Term	*	08.12.2021	29.11.2021	15.11.2021
Last Working Day	*	15.01.2022	24.12.2021	15.12.2021
Commencement of Practical Exams	*	17.01.2022	20.01.2022	16.12.2021
Commencement of Theory Exams	*	27.01.2022	05.01.2022	06.01.2022
Winter Break	Not Applicable			
Commencement of Classes for Even Semesters (2020-21)	II	IV	VI	VIII
	*	10.02.2022	27.01.2022	10.01.2022

Academic Calendar Odd Semester 2021-22				
Particulars	**B. Tech- I**	**B. Tech- III**	**B. Tech- V**	**B. Tech- VII**
Commencement of classes	*	20-09-2021	20-09-2021	01-09-2021
Last Working Day	*	15-01-2022	24-12-2021	15-12-2021
Course Progression Report-I	*	20-10-2021	20-10-2021	20-10-2021
First Mid Term Exam	*	28-10-2021	25-10-2021	25-10-2021
Remedial Class-I	*	08-11-2021	08-11-2021	08-11-2021
Course Progression Report-II	*	04-12-2021	20-11-2021	20-11-2021
Second Mid Term Exam	*	08-12-2021	29-11-2021	22-11-2021
Remedial Class-II	*	16-12-2021	09-12-2021	09-12-2021
Commencement of Theory Exam	*	27-01-2022	05-01-2022	06-01-2022
Commencement of Practical Exam	*	17-01-2022	20-01-2022	16-12-2021

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

I Semester

Common to all branches of UG Engineering & Technology

1FY2-01: Engineering Mathematics-I

Credit: 4 **Max. Marks: 200 (IA:40, ETE:160)**

3L+1T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	**Calculus:** Improper integrals (Beta and Gamma functions) and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.	8
2	**Sequences and Series:** Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions.	6
3	**Fourier Series:** Periodic functions, Fourier series, Euler's formula, Change of intervals, Half range sine and cosine series, Parseval's theorem.	6
4	**Multivariable Calculus (Differentiation):** Limit, continuity and partial derivatives, directional derivatives, total derivative, Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.	10
5	**Multivariable Calculus (Integration):** Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Centre of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.	10
	TOTAL	40

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Course Overview:

Student should be able t learn and solve various calculus and integration related problems in differential sense of equations, they will be able to identify various methods to solve a common problem and various problems in general sense.

Course Outcomes:

CO.NO.	Cognitive Level	Course Outcome
1	Analysis	Students will be able to evaluate volume and surface area of the solid formed by revolution of different curves. Also calculate definite integral through Beta and Gamma functions.
2	Analysis	Students will be able to classify the concept of sequence, monotonic sequence, Cauchy's sequence and infinite series . Also apply various method to test convergence and divergence of sequence and infinite series.
3	Analysis	Learner will be able to identify to express a function in term of a series of sine and cosine.
4	Analysis	Students will be able to evaluate maxima and minima of multivariable functions using the concept of partial differentiation. Also understand the concept of limit, and continuity.
5	Analysis	Students will be able to evaluate double and triple integration and to apply the knowledge to determine area, volume, centre of mass and centre of gravity. Further understand vector differentiation and vector integration..

Prerequisites:

1. Fundamentals of mathematical reasoning.
2. Students should be efficient in identifying differential equation formats.
3. Students should be able to perform simple mathematical operations.

Course Outcome Mapping with Program Outcome:

Course Outcome	Program Outcomes (PO's)											
CO. NO.	Domain Specific (PSO)					Domain Independent (PO)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	0	1	0	0	0	0	0	0	0	1
CO2	2	2	0	1	0	0	0	0	0	0	0	1
CO3	2	2	0	1	0	0	0	0	0	0	0	1
CO4	2	2	0	1	0	0	0	0	0	0	0	1
CO5	2	2	0	1	0	0	0	0	0	0	0	1
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

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Mapping justification

CO	PO	Justification
CO1	PO1	To evalauate volume and surface area of the soild formed by revolution of different curve student must require the knowledge of mathematics, that'swhy CO1 is moderately mapped with PO1.
	PO2	When a student calculate definite integral through beta and gamma function it requires an analysis of problem statement but it does not requires complex analysis so CO1 is mapped with PO2 with moderate level.
	PO4	Students are required to identify and solve problem based on either reactive management or proactive managemeant design that's why CO1 is slightly mapped with PO4 .
	PO12	It is expected that this learning may useful in higher studies when one has to deal with the real life problem that's why CO1is slightly mapped with PO12 .

CO	PO	Justification
CO2	PO1	To understand convergence of sequence and series ,and test of convergence student must require the knowledge of mathematics, that'swhy CO2 is moderately mapped with PO1.
	PO2	When a student calculate power series, taylor series trigonometric and logarithm function It requires an analysis of problem statement but it does not requires complex analysis so CO2 is mapped with PO2 with moderate level.
	PO4	Students are required to identify and solve problem based on either reactive management or proactive managemeant design that's why CO2 is slightly mapped with PO4 .
	PO12	It is expected that this learning may useful in higher studies when one has to deal with the real life problem that's why CO2 is slightly mapped with PO12 .

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	PO	Justification
CO3	PO1	To identity to express a periodic functions ,fourier series and Eulers formula student must require the knowledge of mathematics, that'swhy CO3 is moderately mapped with PO1.
	PO2	When a student calculate change of intervals, half range sine and cosine series it requires an analysis of problem statement but it does not requires complex analysis so CO3 is mapped with PO2 with moderate level.
	PO4	Students are required to identify and solve problem based on either reactive management or proactive managemeant design that's why CO3 is slightly mapped with PO4 .
	PO12	It is expected that this learning may useful in higher studies when one has to deal with the real life problem that's why CO3 is slightly mapped with PO12 .

CO	PO	Justification
CO4	PO1	To evaluate maxima and minima of multivariable function using the concept of parial differentiation student must require the knowledge of mathematics, that's why CO4 is moderately mapped with PO1.
	PO2	When a student understand the concept of limit and continuityof two variable function It requires an analysis of problem statement but it does not requires complex analysis so CO4 is mapped with PO2 with moderate level.
	PO4	Students are required to identify and solve problem based on either reactive management or proactive managemeant design that's why CO4 is slightly mapped with PO4 .
	PO12	It is expected that this learning may useful in higher studies when one has to deal with the real life problem that's why CO4 is slightly mapped with PO12.

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CO	PO	Justification
CO5	PO1	To evaluate double and triple integration and to apply the knowledge to determine area and volume student must require the knowledge of mathematics, that'swhy CO5 is moderately mapped with PO1.
	PO2	When a student calculate center of mass and center of gravity and further understand vector differentiation vector differentiation It requires an analysis of problem statement but it does not requires complex analysis so CO5is mapped with PO2 with moderate level.
	PO4	Students are required to identify and solve problem based on either reactive management or proactive managemeant design that's why CO5is slightly mapped with PO4 .
	PO12	It is expected that this learning may useful in higher studies when one has to deal with the real life problem that's why CO5is slightly mapped with PO12 .

Course coverage module wise-

Lecture No.	Unit	Topic
1	1	**Calculus:** Differentiation and integration revision: Differentiation
2		Integration
3		Integration by Substitution
4		Integration of Rational Functions
5		Introduction of Improper Integrals Beta and Gamma Functions
6		Properties of Beta function
7		Relation between beta and gamma function and related questions
8		Surface area concept and
9		Related questions
10		Surface volume concept and
11		Related questions
12	2	**Sequence and series**: concept of sequence
13		Convergence of sequence
14		Test of convergence (Cauchy's first and second theorem)
15		Concept of infinite series, limit and basic test (comparison test)
16		D' Alembert ratio test, logarithmic ratio test, Rabbe's test and Gauss test
17		Concept of power series , taylor series exponential series, trigonometric and logarithm function
18	3	**Fourier series:** concept of periodic function, Fourier series
19		Euler's formula, Change of interval and related questions
20		Half range sine and cosine series and related questions

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21		Parseval's theorem.
22		Related questions
.23	4	**Multivariable calculus(differentiation)-**,limit of.afunction
24		Continuity of a function
25		Partial derivatives introduction
26		Partial derivatives questions
27		Euler's Theorem and related questions
28		Approximate calculations introduction
29		Related questions
30		Total derivative
31		Maxima and Minima of one variable and two variable
32		Questions on Maxima and Minima of two variable
33		Word problems on Maxima and Minima of two variable
34		Maxima and Minima of more than two variables Lagrange's Multipliers Method
35		Questions on Lagrange's Multipliers Method
36		Concept of gradient curl and divergence
37		Related questions
38	5	**Multivariable calculus(integration)**- concept of double integral (Cartesian)
39		Change of order of integration
40		Change of variable(Cartesian to polar)
41		Area and volume of Curve by double integration
42		Center of mass and gravity(constant and variable densities)
43		Triple integration(Cartesian)
44		Simple application involving cubes sphere and rectangular parallelpiped
45		Sclar line integral with related problem
46		Vector line integral with related problem
47		Scalar Surface Integral with related problems
48		vector Surface Integral with related problems
49		Green's Theorem introduction
50		Related questions
51		Stokes Theorem introduction
52		Related questions
53		Gauss and stokes Theorem introduction
54		Related questions

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BASIC SCIENCE

B.TEC 1-YEAR(1 –SEM)

SUBJECT-ENGINEERING MATHEMATICS

ASSIGNMENT 1

Answer all questions. Each question carries 5 marks

1. Evaluate $\Gamma(1/4)\ \Gamma(3/4)$ -------- co-1
2. Prove that $\int_0^{\pi/2} \sqrt{(\tan\theta)}d\theta = \frac{\pi}{\sqrt{2}}$ ---------co-1
3. Evaluate $\int_0^{\infty} e^{-x^2}dx$ -----------co-1
4. Show that div grad $\phi = \nabla^2\phi$. ------co-4
5. What is the necessary condition to exist maxima or minima of any function f(x,y) --co-4
6. Explain the Leibnitz rule for convergence of Alternating series.-----------co-3
7. Find the region of integration of the double integral $\int_0^a \int_y^a \frac{x\,dx\,dy}{x^2+y^2}$ ---------co-5
8. If $f = (ax+3y+4z)i + (x-2y+3z)j + (3x+2y-z)k$ is a solenoidal vector, find a -----co-5
9. Find b_n for Fourier sine series of f(x) =2 where 0<x<1 .------co-3
10. Evaluate $B(2.5,1.5)$------co-1
11. Evaluate by changing the order of integration $\int_0^{\infty} \int_x^{\infty} \frac{e^{-y}}{y}dx\,dy$ ---------co-5

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BASIC SCIENCE

B.TEC 1-YEAR(1 –SEM)

SUBJECT-ENGINEERING MATHEMATICS

ASSIGNMENT 2

Answer all questions. Each question carries 5 marks

1. By using Taylor's Theorem Expand $\log\sin x$ about x=2-----co-2
2. Evaluate: $\int_C \left[\left(xy + y^2\right)dx + x^2 dy\right]$, where C is the closed curve of the region bounded by y = x and $y = x^2$ by using Green's theorem.-------co-5
3. Evaluate $\int_0^1 \int_x^{\sqrt{(2x-x^2)}} \sqrt{(x^2+y^2)}\,dx\,dy$ by changing into polar co-ordianates-------co-5
4. If $u = f(r)$ where $r = \sqrt{x^2+y^2}$ then prove that $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = f''(r) + \frac{1}{r} f'(r)$ --------co-4
5. Evaluate: $\iint_s F \cdot \hat{n}\, dS,\quad where\ \ F = \left(x+y^2\right)i - 2xj + 2yzk$ and S is the surface of the plane
    a. $2x + y + 2z = 6$ in the first octant.---------co-5
6. Prove that $div\left(r\,grad\frac{1}{r^3}\right) = \frac{3}{r^4} = \nabla.\left[r\nabla\left(\frac{1}{r^3}\right)\right]$-------co-4
7. Explain the power series in x and also find the values of x for which the series $x - \frac{x^2}{2^2} + \frac{x^2}{3^2} - \frac{x^2}{4^2} + \frac{x^3}{3!} + \ldots\ldots$ converges. ------co-3
8. In a triangle ABC, find the maxima and minima of u = sin A sin B sin C, where A + B + C = π.---------co -4
9. Prove that: $\int_0^{\infty} \cos\left(x^2\right)dx = \frac{1}{2}\sqrt{\frac{\pi}{2}}$ ------co-1
10. *Evaluate* $\int_0^1 x^4\left(1-x^2\right)^{5/2} dx$ ----co-1
11. Expand $f(x) = |\cos x|$ in Fourier series in $interval\ -\pi < x < \pi$.-------co-3
12. Verify Gauss Divergence Theorem for $F = 4xi - 2y^2 j + z^2 k$. Where S is the region bounded by $x^2 + y^2 = 4,$ and the plane ------co-5

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BASIC SCIENCE

B.TEC 1-YEAR (1 –SEM)

SUBJECT-ENGINEERING MATHEMATICS

Viva-voce

Unit 1 (C0-1)

1-Define beta function.

2-Define gamma function

3 -write the legender duplication formula .

4- what is the relation between beta and gamma function.

5-write the gamma formula.

6-what is the sur face of revolution.

7-what is the volume of solid of revolution.

Unit 1 (C0-2)

1-what is the difference between sequence and series.

2-Define the real sequence.

3-Define the range of sequence.

4-Define the supremum and infimum of sequence.

5- Write Cauchy first theorem on limit.

6-Define the taylor's series, expotential series and trigonometric function.

Unit 1 (C0-3)

1-Define periodic function.

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2-Define the fourier's series.

3-write the Euier's formula.

Unit 1 (C0-4)

1-Define the limit.

2- Define the continutity.

3- Define the tangent plane and normal line.

4-Define maxima ,minima and saddle points.

5-Define gradient, curl and divergence.

Unit 1 (C0-5)

1-Define Double integrals in Cartesian form

2-Define center of mass and gravity.

3-Define sphere and rectangular parallelepipeds.

4- Define scalar line integral.

5-Define green ,stokes and gauss theorems.

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BASIC SCIENCE

B.TEC 1-YEAR (1 –SEM)

SUBJECT-ENGINEERING MATHEMATICS

QUIZ QUESTION

Attempt all questions. Each question carries 1 mark. No negative marking.

Q-1 What is the value of $\Gamma 1/2$

A) 4
B) 6
C) ½
D) $\sqrt{\pi}$

ANS - $\sqrt{\pi}$

Q-2 $\Gamma n \, \Gamma 1 - n$ is equal to ….

A) $\frac{\Pi}{\sin n\Pi}$
B) π
C) $\frac{2\Pi}{\sin n\Pi}$
D) None of these

ANS - $\frac{\Pi}{\sin n\Pi}$

Q-3 Write the formula of volume of soild of revolution and surface area of soild of revolution is…..

A) V=$\int_a^b \pi y^2$dx and S =$\int_a^b 2\pi y ds$
B) V=$-\int_a^b \pi y^2$dx and S =$-\int_a^b 2\pi y ds$
C) V=$-\int_a^b \pi y^2$
D) S =$-\int_a^b 2\pi y ds$

ANS- V=$\int_a^b \pi y^2$dx and S =$\int_a^b 2\pi y ds$

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. Q-4 The sequence $<(-1)^n>$ is…

A) Convergent
B) Divergent
C) Oscillating infinitely
D) Infinite

ANS – Oscillating infinitely

Q-5 The sequence $\left\{\frac{3n^2+1}{3n^2-1}\right\}$ is….

A) Convergent
B) Divergent
C) Oscillating infinitely
D) Infinite

ANS- Convergent

Q-6 Find the period of the sinx

A) 2π
B) 5π
C) 3π
D) None of these

ANS - 2π

Q-7 Euler's formulae are given by:

A) - $a_0 = \frac{1}{2\pi}\int_{-\pi}^{\pi} f(x)$ dx
B) $a_n == \frac{1}{\pi}\int_{-\pi}^{\pi} cosnx\, f(x)$ dx
C) $b_n = \frac{1}{\pi}\int_{-\pi}^{\pi} sinx\, f(x)$ dx

D) $a_0 = \frac{1}{2\pi}\int_{-\pi}^{\pi} f(x)$ dx $\quad a_n == \frac{1}{\pi}\int_{-\pi}^{\pi} cosnx\, f(x)$ dx

$b_n = \frac{1}{\pi}\int_{-\pi}^{\pi} sinx\, f(x)$ dx

ANS - $a_0 = \frac{1}{2\pi}\int_{-\pi}^{\pi} f(x)$ dx $\quad a_n == \frac{1}{\pi}\int_{-\pi}^{\pi} cosnx\, f(x)$ dx

$b_n = \frac{1}{\pi}\int_{-\pi}^{\pi} sinx\, f(x)$ dx

Q -8 The Euler's Theorem for homogeneous function is given by

A) x $\frac{\partial z}{\partial x}$ +$y\frac{\partial z}{\partial x}$ = nz

B)) x $\frac{\partial z}{\partial x}$ +$y\frac{\partial z}{\partial x}$ = n

C)) x $\frac{\partial z}{\partial x}$ +$y\frac{\partial z}{\partial x}$ =0

D) None of these

ANS -x $\frac{\partial z}{\partial x}$ +$y\frac{\partial z}{\partial x}$ = nz

Q-8 The necessary and sufficient condition for maxima and minima of function of two variable is....

A) r t -s^2 >0 and r < 0 then f (a ,b) is a maximum value
B) r t -s^2 >0 and r >0 then f (a ,b) is a minimum value
C) (1) r t -s^2 >0 and r < 0 then f (a ,b) is a maximum value
(2) r t -s^2 >0 and r >0 then f (a ,b) is a minimum value
D) All of above

ANS – (1) r t -s^2 >0 and r < 0 then f (a ,b) is a maximum value
(2) r t -s^2 >0 and r >0 then f (a ,b) is a minimum value

Q-9 Gauss's Divergence Theorem is given by .....

A) $\int F.n$ds =$\int(\triangle.F)$ dv
B) $\int F.n$ds =$\int(F)$ dv
C) $\int F.n$ds =$\int(Curl.F)$ dv
D) Both A and B

ANS –$\int F.n$ds =$\int(\triangle.F)$ dv

Q10 – If f=xy^2i+2x^2yz j – 3yz^2k ,divf is at the pt(1,-1,1)

A) y + 2x^2z - 6yz
B) y^2 + 2x^2 – 6yz
C) y^2 + 2x^2z +6yz
D) y^2 + 2x^2z – 6yz

ANS - y^2 + 2x^2z - 6yz

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Assessment Methodology:

1. Online quiz after every topic completion.
2. Assignments one from each unit.
3. Midterm subjective paper where they have to write algorithms to perform different operations on different data structures as mentioned in the modules. (Twice during the semester)
4. Final paper at the end of the semester subjective.

Teaching and Learning resources unit-wise:

Unit-1

https://www.classcentral.com/course/swayam-fourier-analysis-and-its-applications-22981

https://nptel.ac.in/courses/111/101/111101153/

Unit-2

https://www.youtube.com/watch?v=m7ATbosllvs&list=PLhSp9OSVmeyI3uivqqHzrlomwD6gZx2-R

Unit-3

https://nptel.ac.in/courses/111/106/111106046/

Unit-4

https://www.youtube.com/watch?v=TrcCbdWwCBc&list=PLSQl0a2vh4HC5feHa6Rc5c0wbRTx56nF7

Unit-5

https://www.youtube.com/watch?v=PxCxlsl_YwY&list=PL4C4C8A7D06566F

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1E2401

Roll No. ______________________ [Total No. of Pages : 3

1E2401

B.Tech. I Semester (Main) Examination, Dec. - 2018

BSC

1FY2-01 Engineering Mathematics - I

Time : 3 Hours | Maximum Marks : 160

Instructions to Candidates:

*Attempt all **ten** questions from **Part A**, any **five** questions out of seven from **Part B** and any **four** questions out of **five** from **Part C**. (Schematic diagrams must be shown wherever necessary). Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Part - A

(Answer should be given up to 25 words only). **All** questions are **compulsory**.

(10×3=30)

1. What is the value of $\Gamma\left(-\frac{1}{2}\right)$.

2. Find the value of $\int_0^{\pi/2} \sin^6\theta\cos^5\theta\, d\theta$.

3. Find whether series $\sum \frac{n}{n+10}$ is convergent or not?

4. Give an example of two divergent series whose sum is convergent.

5. Find sum of Fourier series of f(x) at x = 2 where $f(x) = \begin{cases} 0, 0 \le x < 1 \\ 1, 1 \le x < 2 \end{cases}$.

6. State Parseval's Theorem.

7. Give an example of two variable function whose both partial derivatives exist but limit does not exist at origin.

8. Find the directions in which $f(x,y)=\frac{x^2}{2}+\frac{y^2}{2}$ increases most rapidly at the point (1,1).

9. Suppose the force field $F=\nabla f$ is the gradient of the function $f(x,y,z)=-\frac{1}{(x^2+y^2+z^2)}$. Find the work done by F in moving an object along a smooth curve C joining (1,0,0) to (0,0,2) that does not pass through origin.

10. Find $\iint_S \vec{r}.\hat{n}\, dS$ where S is a closed surface enclosing volume V and $\vec{r}=xi+yj+zk$.

Part - B

(Analytical/Problem solving questions). **Attempt any five questions.** **(5×10=50)**

1. Find volume of the solid generated by the revolution of the curve $x=a\cos^3\theta, y=a\sin^3\theta$ about the x-axis.

2. Find Taylor series expansion of $f(x) = \cos 5x^2$ about the point $x=\pi$.

3. Obtain half range sine series for $f(x) = e^x$, in $0<x<1$.

4. If resistors of R_1, R_2 and R_3 ohms are connected in parallel to make an R-ohm resistor, find the value of $\partial R/\partial R_2$ when $R_1 = 30$, $R_2 = 45$ and $R_3 = 90$ ohms.

5. The derivative of f(x,y) at $P_0(1,2)$ in the direction of i+j is $2\sqrt{2}$ and in the direction of -2j is -3. What is the derivative of f in the direction of -i-2j?

6. Find the area of the region R in the xy-plane enclosed by the circle $x^2+y^2=4$ above the line y = 1 and below the line $y=\sqrt{3}x$.

7. Find the centroid of the region in the first quadrant that is bounded above by the line y = x and below by the parabola $y = x^2$.

Part - C

(Descriptive/Analytical/Problem Solving/Design question). **Attempt any four questions.** **(4×20=80)**

1. **Find the value of $\int_0^\infty \cos x^2 dx$.**

2. Discuss the convergence of the series $\sum \frac{\sqrt{n}}{\sqrt{n^2+1}}x^n$.

3. Find Fourier series representation of $f(x)=\begin{cases}0, & -\pi < \\ \sin x, & 0 <\end{cases}$

$\frac{1}{1.3}+\frac{1}{3.5}+\frac{1}{5.7}+\ldots=\frac{1}{2}$

4. The plane $x+y+z=1$ cuts the cylinder $x^2+y^2=1$ in an ellipse that lie closest to and farthest from origin.

5. Verify Stoke's theorem for the hemisphere $S: x^2+y^2+$ $C: x^2+y^2=9, z=0$, and the field $F=yi-xj$.

Result Analysis 2020

S.No.	Roll No.	Name	Maths		
			1	2	Grade
1	19ETCCS001	ABHA RATHORE	27	79	D+
2	19ETCCS002	ABHISHEK MAHESHWARI	37	126	A++
3	19ETCCS003	AKSH MEHTA	38	124	A++
4	19ETCCS004	ANIKET KOTHARI	16	39	F
5	19ETCCS005	AVANI GUPTA	39	117	A+
6	19ETCCS006	BHAVESH JINDAL	40	144	A++
7	19ETCCS007	BHAVINI JAIN	39	129	A++
8	19ETCCS008	CHIRAG RAMEJA	27	76	D+
9	19ETCCS009	DARSHANA JAIN	31	85	C
10	19ETCCS011	DEV TIWARI	36	100	B+
11	19ETCCS012	DHANRAJ THAWANI	36	116	A
12	19ETCCS013	DHARMISHTHA AJMERA	38	98	B+
13	19ETCCS014	DIKSHA BAPNA	30	67	D
14	19ETCCS015	DIKSHA UDANIYA	37	89	B
15	19ETCCS016	DIPESH VYAS	23	0	F
16	19ETCCS017	DIVYANSH NAGDA	26	69	D
17	19ETCCS018	DIVYANSHI THAKURANI	37	50	E+
18	19ETCCS019	DIVYATA SANADHYA	29	25	F
19	19ETCCS020	DIXITA MALI	38	81	C+
20	19ETCCS021	GANESHAM TAILOR	23	0	F
21	19ETCCS022	HARDIK JOSHI	37	56	D
22	19ETCCS023	HARSH ARORA	26	25	F
23	19ETCCS024	HARSHIT CHAUBISA	39	143	A++
24	19ETCCS025	HARSHIT PALIWAL	29	76	D+
25	19ETCCS026	HIMANSHU DADHEECH	39	93	B
26	19ETCCS027	HRISHITA BHANDARI	31	97	B
27	19ETCCS028	HUSSAIN	38	70	C
28	19ETCCS029	JAI KANTHALIA	26	58	E+
29	19ETCCS030	KANISHKA JAIN	39	130	A++
30	19ETCCS032	KRITIKA KUMAWAT	39	100	B+
31	19ETCCS033	LAVI VASHISHTH	37	77	C
32	19ETCCS034	LUCKY MURDIA	30	90	C+
33	19ETCCS035	LUTISHT JOSHI	25	60	E+
34	19ETCCS036	MAHENDRA GEHLOT	39	120	A+
35	19ETCCS037	MANISH SAINI	29	42	F
36	19ETCCS038	MILIND GOUR	38	111	A
37	19ETCCS039	MUGDHA KUMAWAT	29	78	D+
38	19ETCCS040	MUSTANSIR JUKKAR	37	95	B
39	19ETCCS041	NANDESHWARI RANAWAT	39	92	B
40	19ETCCS042	NAVISHREE JAIN	37	[illegible]	B
41	19ETCCS043	NEHA PRASAD HANUMAN	22	0	F
42	19ETCCS044	PARIDHI SHAH	31	46	F

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43	19ETCCS045	PARTHA BISWAS	25	16	F
44	19ETCCS046	PRADHUMN SHARMA	37	77	C
45	19ETCCS047	PRAGYA SINGH	36	94	B
46	19ETCCS048	PRAJJWAL PALIWAL	25	4	F
47	19ETCCS049	PRANJAL DAK	26	36	F
48	19ETCCS050	PRANJAL KATHAIT	30	49	E
49	19ETCCS051	PRIYAL JAIN	29	64	D
50	19ETCCS052	PRIYANSHU UPADHYAY	25	81	D+
51	19ETCCS053	RITIKA JAIN	37	103	B+
52	19ETCCS054	RIYA SHARMA	30	81	C
53	19ETCCS055	SAKSHI	31	81	C
54	19ETCCS056	SAMEER	23	60	E+
55	19ETCCS057	SANJANA	36	80	C
56	19ETCCS058	SANSKRUTI	28	58	E+
57	19ETCCS059	SANYAM	37	32	F
58	19ETCCS060	SAURABH	25	37	F
59	19ETCCS061	SAURABH SISODIA	40	126	A++
60	19ETCCS062	SAYYAD SARFRAZ	26	65	D
61	19ETCCS063	SHARMA JIGNESH	26	35	F
62	19ETCCS064	SHIVALIKA	28	38	F
63	19ETCCS065	SHIVANSH	drop out		
64	19ETCCS066	SHREYA	28	27	F
65	19ETCCS067	SOUMYA	39	100	B+
66	19ETCCS068	SUHANI	27	30	F
67	19ETCCS069	TAHER	36	49	E+
68	19ETCCS070	TANU SHARMA	36	73	C
69	19ETCCS071	TARANNUM	30	101	B
70	19ETCCS072	TARUN KUMAR	24	40	F
71	19ETCCS073	TUSHAR	22	14	F
72	19ETCCS074	UDIT	40	132	A++
73	19ETCCS075	UTKARSH	31	66	D
74	19ETCCS076	VAIBHAV BHATNAGAR	39	89	B
75	19ETCCS077	VAIBHAV MISHRA	39	91	B
76	19ETCCS078	VAIBHAVRAJ NATH	39	89	B
77	19ETCCS079	VINISHA JAIN	30	108	B+
78	19ETCCS080	VIPUL KUMAR TAMBOLI	39	101	B+
79	19ETCCS081	VISHWAJEET	36	69	D+
80	19ETCCS082	VIVEK	20	37	F
81	19ETCCS083	VYSHNAVI	26	57	E+
82	19ETCCS084	YASHMITH	28	137	A++
83	19ETCCS085	YOGESH	37	101	B+
84	19ETCCS086	YOGIK	30	48	E

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Pass	65	77.38%
Fail	19	22.61%
Total	84	

TECHNO INDIA NJR INSTITUTE OF TECHNOLOGY

UDAIPUR 313003 RAJ

Date: 09/11/2020

NOTICE

This is to inform all the students of first semester (2020-21 academic sessions) that the remedial classes will commence from 14/11/2020 (online mode). It is compulsory for the students securing less than 50% marks in first midterm. Attendance will be monitored closely.

Please contact the concerned subject teacher for time slot.

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Dr. Pankaj Kumar Porwal
(Principal)

DR. PANKAJ PORWAL

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(Principal)

TECHNO INDIA NJR INSTITUTE OF TECHNOLOGY

UDAIPUR 313003 RAJ.

Date: 07/12/2020

NOTICE

This is to inform all the students of first semester (2020-21 academic sessions) that the remedial classes will commence from 10/12/2020 (online mode). It is compulsory for the students securing less than 50% marks in second midterm. Attendance will be monitored closely.

Please contact the concerned subject teacher for time slot.

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Techno India NJR Institute of Technology
First Mid Term Exam 2020-21

Semester :- I   Subject:- Engineering Mathematics   Max. Marks :-70

Note: : Part A is compulsory attempt any four questions out of six questions from Part B and from Part C attempt two questions out of three questions.

	Part:-A	(10x2=20)	
Q.1	(i) Evaluate $\Gamma(-3/2)$		CO-1
	(ii) Evaluate $\int_0^1 \sqrt{\left(\frac{1-x}{x}\right)}dx$		CO-1
	(iii) Evaluate $\int_0^\infty x^4 e^{-x} dx$		CO-1
	(iv)If $u = \log\left(\frac{x^3+y^3}{x^2+y^2}\right)$ then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 1$		CO-4
	(v)Evaluate $\frac{\partial^2 z}{\partial x^2}$ if $z = \tan^{-1}\left(\frac{x}{y}\right)$		CO-4
	(vi) What is the necessary condition to exist maxima or minima of any function f(x,y)		CO-4
	(vii)What do you know about even and odd function.		CO-3
	(viii) Find the value of a_n for $f(x) = x\cos x$ in the interval $(-1,1)$		CO-3
	(ix)Evaluate $\int_0^\pi x \sin x dx$		CO-3
	(x) If $f(x) = x + x^2$ then find the sum of the series at $x = \pm\pi$		CO-3

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	Part:-B	(4x5=20)	
Q2	Evaluate $\int_0^{\pi/6} \cos^4 3\theta \sin^2 6\theta d\theta$		CO-1
Q.3	Obtain the Fourier series for the function $y=\lvert x\rvert$ in the interval $-1 < x < 1$		CO-3
Q4.	If $\frac{x^2}{a^2+u}+\frac{y^2}{b^2+u}+\frac{z^2}{c^2+u}=1$ then prove that $u_x^2+u_y^2+u_z^2=2(xu_x+yu_y+zu_z)$		CO-4
Q5.	If $u=f\left(\frac{x}{y},\frac{y}{z},\frac{z}{x}\right)$ then prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}+z\frac{\partial u}{\partial z}=0$		CO-4
Q.6	A rectangular box, open at the top, is to have a given capacity. Find the dimension of the box requiring least material for its construction .		CO-4
Q.7	Find the max. or min. of $u=x^2+y^2+\frac{2}{x}+\frac{2}{y}$		CO-4
	Part:-C	(2x15=30)	
Q8	Find the Fourier series for $f(x) = x\sin x,\ -\pi < x < \pi$ and deduce that $\frac{\pi}{4}=\frac{1}{2}+\frac{1}{1.3}-\frac{1}{3.5}+\cdots$		CO-3
Q.9	Divide n into three parts such that their product is maximum		CO-4
Q.10	(i)Evaluate $\int_0^1 x^4\left(\log\frac{1}{x}\right)^3$ (ii)Evaluate $\int_0^\infty \frac{dx}{1+x^4}$		CO-1

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Second Mid Term Exam 2020-21

Semester :- I **Subject:- Engineering Mathematics** **Max. Marks :-70**

Note: : Part A is compulsory, attempt any five questions out of seven questions from Part B and from Part C attempt three questions out of five questions.

Part:-A

Q.1	(i) Evaluate $\Gamma(1/4)\ \Gamma(3/4)$	**(10x2=20)**	**CO-1**
	(ii) Prove that $\int_0^{\pi/2} \sqrt{(\tan\theta)}d\theta = \frac{\pi}{\sqrt{2}}$		**CO-1**
	(iii) Evaluate $\int_0^{\infty} e^{-x^2} dx$		**CO-1**
	(iv) Show that div grad $\phi = \nabla^2\phi$..		**CO-5**
	(v) Evaluate $B(2.5,1.5)$		**CO-1**
	(vi) What is the necessary condition to exist maxima or minima of any function f(x,y)		**CO-4**
	(vii) Explain the Leibnitz rule for convergence of Alternating series		**CO-2**
	(viii) Find the region of integration of the double integral $\int_0^a \int_y^a \frac{x\ dx\ dy}{x^2+y^2}$		**CO-5**
	(ix) If $f = (ax+3y+4z)i + (x-2y+3z)j + (3x+2y-z)k$ is a solenoidal vector, find a		**CO-5**
	(x) Find b_n for Fourier sine series of f(x) =2 where 0<x<1		**CO-3**
	Part:-B	**(4x5=20)**	
Q2	Evaluate by changing the order of integration $\int_0^{\infty} \int_x^{\infty} \frac{e^{-y}}{y} dx\, dy$		**CO-5**
Q.3	By using Taylor's Theorem Expand $\log\sin x$ about x=2		**CO-2**
Q4.	Evaluate: $\int_C \left[(xy+y^2)dx + x^2dy\right]$, where C is the closed curve of the region bounded by y = x and y = x^2 by using Green's theorem.		**CO-5**

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Q5	Evaluate $\int_0^1 \int_x^{\sqrt{(2x-x^2)}} \sqrt{(x^2+y^2)}dx\,dy$ by changing into polar co-ordianates		CO-5
Q6	If $u = f(r)$ where $r = \sqrt{x^2+y^2}$ then prove that $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = f''(r) + \frac{1}{r}f'(r)$		CO-4
Q7	Evaluate: $\iint_s F \cdot \hat{n}\, dS, \quad where \quad F = (x+y^2)i - 2xj + 2yzk$ and S is the surface of the plane $2x + y + 2z = 6$ in the first octant.		CO-5
Q8	Prove that $div\left(rgrad\frac{1}{r^3}\right) = \frac{3}{r^4} = \nabla.\left[r\nabla\left(\frac{1}{r^3}\right)\right]$		CO-5
	Part:-C	**(2x15=30)**	
Q9	Explain the power series in x and also find the values of x for which the series $x - \frac{x^2}{2^2} + \frac{x^2}{3^2} - \frac{x^2}{4^2} + \frac{x^3}{3!} + \ldots\ldots$ converges.		CO-2
Q.10	In a triangle ABC, find the maxima and minima of u = sin A sin B sin C, where A + B + C = π.		CO-4
Q.11	(i) $Evaluate \int_0^1 x^4(1-x^2)^{5/2}dx$ (ii) . Prove that: $\int_0^{\infty} \cos(x^2)dx = \frac{1}{2}\sqrt{\frac{\pi}{2}}$		CO-1
Q.12	Expand $f(x) = \lvert\cos x\rvert$ in Fourier series in $interval\ -\pi < x < \pi$		CO-3
Q.13	Verify Gauss Divergence Theorem for $F = 4xi - 2y^2j + z^2k$. Where S is the region bounded by $x^2 + y^2 = 4$, and the plane $z = 0$, $z = 3$.		CO-5

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