2401ET055

Roll No. | | | | | | | | | | | | |

Course: B. Tech Computer Science and Engineering (AI/MI)
Subject: Engineering Mathematics,
Subject Code: ETMT-109
Semester: I

Time: 03 Hours **Max Marks: 70**

Instructions to the Students:

1. This Question paper consists of two Sections. All sections are compulsory.
2. Section A comprises 10 questions of short answer type. All questions are compulsory. Each question carries 02 marks.
3. Section B comprises 8 long answer type questions out of which students must attempt any 5. Each question carries 10 marks.
4. Do not write anything on the question paper.

Q.No.		SECTION –A (SHORT ANSWER TYPE QUESTIONS)	Marks
1.	a.	Find the principal and general value of $\log(-1+i)$.	(2)
	b.	If $\sin(\alpha+i\beta)=x+iy$, prove that $x^2cosec^2\alpha - y^2\sec^2\alpha = 1$.	(2)
	c.	Test the convergence of the following series: $$\frac{1}{1+\sqrt{2}}+\frac{2}{1+2\sqrt{3}}+\frac{3}{1+3\sqrt{4}}+\cdots$$	(2)
	d.	Test the convergence of the infinite series $\sum u_n$ whose n^{th} term is given by $$u_n=\frac{n!}{n^n}$$	(2)
	e.	If $y=a\cos(logx)+b\sin(logx)$, show that $$x^2y_{n+2}+(2n+1)xy_{n+1}+(n^2+1)y_n=0.$$	(2)
	f.	Find the radius of curvature of the curve $\sqrt{x}+\sqrt{y}=1$ at the point $\left(\frac{1}{4},\frac{1}{4}\right)$.	(2)
	g.	For what value of "b" the rank of the matrix $A=\begin{bmatrix}1&5&4\\0&3&2\\b&13&10\end{bmatrix}$ is 2 ?	(2)
	h.	Show that the system of equations $$x+y+z=-3,$$ $$3x+y-2z=-2,$$ $$2x+4y+7z=7$$ are not consistent.	(2)

i. Solve $x^2y\,dx-(x^3+y^3)dy=0$ (2)

j. Solve $(D^2-3D+2)y=coshx$ (2)

SECTION –B (LONG ANSWER TYPE QUESTIONS)

2. If $\tan(\theta+i\emptyset)=tan\alpha+i\,sec\alpha$, then prove that (10)

$$e^{2\emptyset}=\pm\cot(\tfrac{\alpha}{2}) \quad \text{and} \quad 2\theta=n\pi+\tfrac{\pi}{2}+\alpha.$$

3. Test the convergence of the following series: (10)

$$\sum\frac{n!\,x^n}{3.5.7\ldots..(2n+1)}.$$

4. Define absolute and conditionally convergent series. Examine the convergence and absolute convergence of the series $\sum\frac{(-1)^{n+1}n}{n^2+1}$. (10)

5. If $y=\left[x+\sqrt{1+x^2}\right]^m$, using Leibnitz theorem, find $(y_n)_0$. (10)

6. Find all the asymptotes of the curve $y^3-xy^2-x^2y+x^3+x^2-y^2-1=0$. (10)

7. Find the perimeter of the cardioid $r=a(1+cos\theta)$. (10)

8. Find the eigenvalues and eigenvectors of the matrix (10)

$$A=\begin{bmatrix}8 & -6 & 2\\ -6 & 7 & -4\\ 2 & -4 & 3\end{bmatrix},$$

and also verify Cayley-Hamilton theorem.

9. Solve $(x^2D^2-xD-3)y=x^2logx.$ (10)

===END OF PAPER===