MID TERM EXAMINATION

B.TECH PROGRAMMES (UNDER THE AEGIS OF USICT)

2ⁿᵈ Semester, May, 2023

Paper Code: BS-112

Subject: Applied Mathematics-II

Time: 1½Hrs.

Max. Marks: 30

Note: Attempt Q.No.1 which is compulsory and any two more questions from remaining.

1. (a) Principal Argument of $(1 + i)^{20}$ (2 ½)

1. (b) Find $Re(e^{e^z})$ (2)

1. (c) Integrate $Re(z)$ along the line 0 to $1 + 2i$ (3)

1. (d) Find the residue of $f(z) = \frac{\coth z}{z-i}$ at each of the poles. (2 ½)

2. (a) Find Modulus and principal argument of $z = -1 - i\sqrt{3}$ and verify the result that multiplication by i is geometrically a counterclockwise rotation through $\pi/2$ by graphing z and iz and the angle of rotation. (5)

2. (b) Find all Taylor and Laurent series of $f(z) = \frac{-2z+3}{z^2-3z+2}$ in the region $1 < |z| < 2$. (5)

3. (a) Find $Re(\cosh z)$ and all solution of $\cosh z = 1$ (5)

3. (b) Evaluate $\oint \frac{e^z}{(z+1)^2} dz$, along C
where C is the circle $|z - 1| = 3$ (5)

4. (a) An electrical field $f(z) = \phi(x, y) + i\psi(x, y)$ in the xy- plane, the potential function $\phi(x, y) = 3x^2 y - y^3$ is given. Find the stream function $\psi(x, y)$ and electric field f(z). (5)

4. (b) Find the image of the infinite strip $0 < y < \frac{1}{2}$ under the mapping $w = \frac{1}{z}$ (5)

June, 2023

Semester: II

Subject: Applied Mathematics-II
Max. Marks: 30

PAPER CODE: BS:112
Time: $1\frac{1}{2}$ Hrs

Note: attempt Q. No. 1 which is compulsory and any two more from remaining.

Q.1.

(a) State Convolution theorem for inverse Laplace transform.   2   CO 3

(b) If $f(t) = \begin{cases} 1 & 1<t<2 \\ 3-t & 2<t<3 \end{cases}$ Find Laplace transform by using Unit Step Function   2   CO 3

(c) Find $L^{-1}\dfrac{1}{2s(s-1)}$ 2   CO 3

(d) Classify the Partial Differential Equation $2\dfrac{\partial^2 u}{\partial x^2}+4\dfrac{\partial^2 u}{\partial x\partial y}+3\dfrac{\partial^2 u}{\partial y^2}=0$ 2   CO4

(e) Write the Partial Differential Equation of one-dimensional Wave equation.   2   CO4

Q.2. (a) Find the Fourier Series expansion of function $f(x)=x^2$, $-\pi<x<\pi$

And also prove that $\dfrac{\pi^2}{12}=\dfrac{1}{1^2}-\dfrac{1}{2^2}+\dfrac{1}{3^2}-\dfrac{1}{4^2}+\ldots\ldots$ 5 CO3

(b) Find Laplace transform of $\dfrac{Cos\,at-Cos\,bt}{t}$ 5 CO3

Q.3.(a) Using the method of Separation of Variable , Solve $\dfrac{\partial u}{\partial x}=2\dfrac{\partial u}{\partial t}+u$ Where $u(x,0)=6e^{-3x}$.   5 CO4

(b) A string is stretched and fastened to two points l apart. Motion is started by displacing the string

In the form $y=a\sin\dfrac{\pi x}{l}$ from which it is released at a time t=0. Show that the displacement of any

Point at a distance x from one end at time t is give by $y(x,t)=a\sin(\dfrac{\pi x}{l})\cos(\dfrac{\pi ct}{l})$ 5 CO 4

Q.4.(a) Determine the solution of one-Dimensional heat equation

$\dfrac{\partial u}{\partial t}=c^2\dfrac{\partial^2 u}{\partial x^2}$, subject to the boundary condition $u(0,t)=0$, $u(l,t)=0$ $u(x,0)=l$

. l being the length of the bar .   5 CO 4

(b) Using Laplace transforms, find the solution of initial value problem $y''+9y=6\cos 3t$

Given $y(0)=2$, $y'(0)=0$.   5 CO3