Reg. No. | | | | | | | | | | | | | | |

B. E / B. TECH.DEGREE EXAMINATIONS, MAY 2023

Second Semester

MA18251 – ENGINEERING MATHEMATICS II

(Common to all branches except MR)

(Regulation 2018 /Regulation2018A)

TIME:3 HOURS **MAX. MARKS: 100**

CO1	Interpret the fundamentals of vector calculus and be fluent in the use of Stokes theorem and Gauss divergence theorem.
CO2	Express proficiency in handling higher order differential equations
CO3	Determine the methods to solve differential equations using Laplace transforms and Inverse Laplace transforms.
CO4	Explain Analytic functions and Categorize transformations.
CO5	Solve complex integrals using Cauchy integral theorem and Cauchy's residue theorem.

PART- A(10x2=20Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Find a unit normal vector to the surface $x^2+y^2-2z+3=0$ at $(1,2,-1)$	1	2
2.	If $\vec{V}=(x+3y)\vec{i}+(y-2z)\vec{j}+(x+\lambda z)\vec{k}$ is solenoidal, find λ.	1	2
3.	Solve $(D^3 - 4D^2 + 4D)\,y = 0$	2	2
4.	Transform the equation $(2x + 3)^2 y'' - 2(2x + 3)y^1 + 2y = 6x$ into a differential equation with constant coefficients.	2	2
5.	State Initial Value and Final Value Theorem for Laplace transform.	3	1
6.	Find $L(\sin^2 2t)$.	3	2
7.	Find the invariant points of the transformation $w=\frac{z-1}{z+1}$.	4	2
8.	Define conformal mapping.	4	1
9.	State Cauchy's integral formula.	5	1
10.	Evaluate $\int_C \frac{\cos \pi z}{z-1}dz$ if C is $\lvert z\rvert=2$.	5	2

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PART- B (5x 14 =70 Marks)

			Marks	CO	RBT LEVEL
11. (a)	**(i)**	Show that $\vec{F}=(2xy+z^3)\vec{i}+x^2\vec{j}+3xz^2\vec{k}$ is a conservative vector field and find its scalar potential.	**(7)**	**1**	**3**
	(ii)	Find the angle between the normal to the surface $xy^3z^2=4$ at the points (-1, -1,2) and (4, 1, -1).	**(7)**	**1**	**3**
		(OR)			
(b)		Verify Gauss divergence theorem for $\vec{F}=xy^2\vec{i}+yz^2\vec{j}+zx^2\vec{k}$ over the region bounded by $x=0, x=1, y=0, y=2, z=0, z=3$	**(14)**	**1**	**3**
12. (a)	**(i)**	Solve $(D^2-3D+2)\,y = 2\cos(2x+3) + 2e^x$	**(7)**	**2**	**3**
	(ii)	Solve by the method of variation of parameter: $(D^2 + a^2)\,y = \tan ax$	**(7)**	**2**	**3**
		(OR)			
(b)	**(i)**	Solve the following simultaneous differential equation: $(D+2)x + 3y = 2e^{2t}$; $3x + (D+2)y = 0$	**(7)**	**2**	**3**
	(ii)	Solve $[(2x+3)^2D^2-2(2x+3)D-12]\,y = 6x$	**(7)**	**2**	**3**
13. (a)	**(i)**	Find the Laplace transform of the rectangular-wave function $f(t)=\begin{cases} t, 0\le t\le a \\ 2a-t, a\le t\le 2a\end{cases}$ and $f(t+2a)=f(t)$	**(7)**	**3**	**3**
	(ii)	Find the inverse Laplace transform of $\frac{s^2}{(s^2+a^2)(s^2+b^2)}$ using convolution theorem.	**(7)**	**3**	**3**
		(OR)			
13.(b)	**(i)**	Solve the differential equation $y''-3y'-4y=2e^{-t}, y(0)=1=y'(0)$ by using Laplace transform.	**(7)**	**3**	**3**
	(ii)	Find the Laplace transform of $\frac{e^{-at}-e^{-bt}}{t}$.	**(7)**	**3**	**3**
14. (a)	**(i)**	Find the bilinear transformation that maps the points $z=0,1,\infty$ on to $w=i,-1,-i$.	**(7)**	**4**	**3**
	(ii)	Find the image of the infinite strips 0 < y < ½ under the transformation w = 1/z.	**(7)**	**4**	**3**

(OR)

			Marks	CO	RBT
(b)	**(i)**	Show that the function $u(x,y)=3x^2y+2x^2-y^3-2y^2$ is harmonic. Find the conjugate harmonic function.	**(7)**	**4**	**3**
	(ii)	Find the analytic function f(z) = u+iv where u - v = e^x (cosy-siny).	**(7)**	**4**	**3**
15. (a)	**(i)**	Find the Laurent's series expansion of the function $f(z)=\dfrac{z^2-1}{z^2+5z+6}$ for $\lvert z\rvert>3$.	**(7)**	**5**	**3**
	(ii)	Evaluate $\int_C \dfrac{\sin\pi z^2+\cos\pi z^2}{(z-2)(z-3)}dz$ where C is $\lvert z\rvert=4$ using Cauchy's integral formula.	**(7)**	**5**	**3**

(OR)

			Marks	CO	RBT
(b)	**(i)**	Using Cauchy's residue theorem, evaluate $\int_C \dfrac{\sin\pi z^2+\cos\pi z^2}{(z+1)(z+2)}dz$ where C is the circle $\lvert z\rvert=3$.	**(7)**	**5**	**3**
	(ii)	Using contour integration, evaluate $\int_0^{2\pi}\dfrac{\cos 3\theta}{5-4\cos\theta}d\theta$	**(7)**	**5**	**3**

PART- C (1x 10=10Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	Verify Green's theorem for $\int_C\left[(3x^2-8y^2)dx+(4y-6xy)dy\right]$, where C is the boundary of the region defined by $x=0, y=0$, $x+y=1$	**(10)**	**1**	**3**

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