Q. Code:624950

Reg.No

B.E / B.TECH. DEGREE EXAMINATIONS, MAY 2024

Second Semester

MA18252-MATHEMATICS FOR MARINE ENGINEERING-II

(Marine Engineering)

(Regulation 2018 & 2018A)

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

CO 1 Understand the concepts of ordinary differential equations in the field of engineering.

CO 2 Understand the procedure to solve higher order differential equations and apply real time engineering problems.

CO 3 Acquire the concepts of vector calculus for solving problems.

CO 4 Understand the concepts of analytic functions which are widely used in marine engineering problems.

CO 5 Acquire knowledge in Laplace transforms which are used in efficiently solving the problems that occur in various branches of engineering disciplines.

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1	Determine the order and degree of the differential equation $\frac{d^6y}{dx^6}-100x^{62}\left(\frac{dy}{dx}\right)^8-xy=0.$	**1**	**2**
2	Solve $\frac{dy}{dx}=\frac{1+y^2}{1+x^2}$.	**1**	**3**
3	Find the Particular Integral of $(D^2-3D+2)\ y = 2e^x$	**2**	**2**
4	Solve $(D^2-4D+4)y=0$	**2**	**3**
5	Find a unit normal to the surface $x^2y+2xz^2=8$, at the point (1,0,2).	**3**	**2**
6	Find λ such that $\vec{F}=(x+3y)\vec{i}+(y-2z)\vec{j}+(x+\lambda z)\vec{k}$ is solenoidal.	**3**	**2**
7	Check whether the following function is harmonic or not, $u=2x-x^3 3xy^2$.	**4**	**3**
8	Find the fixed points of $w=\frac{2zi+5}{z-4i}$.	**4**	**2**
9	Find the Laplace transform of $e^{-5t}t^7$.	**5**	**2**
10	Find $L^{-1}\left(\frac{s}{(s+2)^2}\right)$.	**5**	**2**

PART- B (5 x 14 = 70 Marks)

			Marks	CO	RBT LEVEL
11(a)	**(i)**	Check whether the differential equation is exact or not. Hence solve it. $(5x^4+3x^2y^2-2xy^3)dx+(2x^3y-3x^2y^2-5y^4)dy=0.$	**(7)**	**1**	**3**
	(ii)	Solve $(x^2-y^2)dx=xydy$.	**(7)**	**1**	**3**

(OR)

11(b)	**(i)**	Find the orthogonal trajectory of the cardioids $r=a(1-\cos\theta)$	**(7)**	**1**	**3**
	(ii)	Solve $\frac{dy}{dx}=e^{3x-2y}+x^2e^{-2y}$, by variable separable method.	**(7)**	**1**	**3**
12(a)		Solve Dx + y = sint ; x + Dy = cost given that x=2,y=0 at t=0.	**(14)**	**2**	**3**
		(OR)			
12(b)	**(i)**	Solve $(x^2D^2 - 2xD - 4)\, y = x^2 + 2\log x$	**(7)**	**2**	**3**
	(ii)	Solve $(D^2+a^2)y=\tan ax$ by method of variation of parameter.	**(7)**	**2**	**3**
13(a)		Verify Green's theorem for the following: $\int_C (xy+y^2)dx+x^2dy$, where C is the boundary of the area bounded by $y = x, y = x^2$	**(14)**	**3**	**3**
		(OR)			
13(b)		Verify Stoke's theorem for a vector field defined by $\vec{F}=(x^2-y^2)\vec{i}+2xy\,\vec{j}$ in the rectangular region in the XOY plane bounded by the lines $x=0, x=a, y=0, y=b$.	**(14)**	**3**	**3**
14(a)	**(i)**	If $u=\log(x^2+y^2)$, then find v, and $f(z)$ such that $f(z)=u+iv$ is analytic.	**(7)**	**4**	**3**
	(ii)	Find the image if $\lvert z-2i\rvert=2$ under the transformation $w=\frac{1}{z}$	**(7)**	**4**	**3**
		(OR)			
14(b)		Find the bilinear transformation that maps the points z = 1, i, -1 onto the points w = i, 0, -i. Hence find the image of $\lvert z\rvert < 1$.	**(14)**	**4**	**3**
15(a)	**(i)**	Find $L\left[\frac{\sin at}{t}\right]$. Hence show that $\int_0^\infty \frac{\sin t}{t}dt=\frac{\pi}{2}$	**(7)**	**5**	**3**
	(ii)	Apply convolution theorem to evaluate $L^{-1}\left[\frac{s}{(s^2+a^2)^2}\right]$.	**(7)**	**5**	**3**
		(OR)			
15(b)	**(i)**	The square-wave function $f(t)=\begin{cases}1 & when\ 0<t\le\frac{a}{2}\\ -1 & when\ \frac{a}{2}<t<a\end{cases}$ and $f(t+a)=f(t)$ Find the Laplace transform of $f(t)$.	**(7)**	**5**	**3**
	(ii)	Solve the differential equation, $y''-2y'+y=e^t,\ y(0)=2,\ y'(0)=-1$ using Laplace transform.	**(7)**	**5**	**3**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

Marks **CO** **RBT**

			LEVEL	
16	Find the angle between the surfaces, $x^2+y^2+z^2=9 \wedge z=x^2+y^2-3$ at $(2,-1,2)$.	**(10)**	**3**	**3**

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