Q. Code: 322435

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

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

First Semester

MA22152 – APPLIED MATHEMATICS I FOR MARINE ENGINEERS

(Regulation 2022)

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

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Apply the basic concepts of analytical geometry in marine engineering problems.	**3**
CO 2	Apply the basic notion of calculus to engineering problems and to tackle different geometries.	**3**
CO 3	Perform calculus for more than one variable and its applications in engineering problems.	**3**
CO 4	Perform integration to compute arc lengths, volumes of revolution and surface areas of revolution.	**3**
CO 5	Apply integration to compute multiple integrals, area, moment of inertia, integrals in polar coordinates, in addition to change of order.	**3**

PART- A (20 x 2 = 40 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Find the centre and radius of the sphere $x^2+y^2+z^2-2x-4y-6z-2=0$	**1**	**2**
2.	Find the equation of the cone with vertex at the origin and passing through the curve $x^2+y^2=9, z=3.$	**1**	**2**
3.	Find the equation of the tangent plane to the sphere $x^2+y^2+z^2-x+5y-3z=0$ at (0,0,3).	**1**	**2**
4.	Find the equation of the sphere on the join of (1,-1,-1) and (-1, 2, 3) as diameter.	**1**	**2**
5.	Find the Taylor's series expansion of f(x)=cosx about $x=\frac{\pi}{2}$	**2**	**2**
6.	If $f(x)=x^3-3x+2$, find $f'(3)$.	**2**	**2**
7.	Differentiate $8x^8+2tan\,x+e^{-3x}$	**2**	**2**
8.	Find the nth derivative of $\sin(5x+3)$	**2**	**2**
9.	If $u=\frac{x}{y}+\frac{y}{z}+\frac{z}{x}$, find $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}+z\frac{\partial u}{\partial z}$.	**3**	**2**
10.	Find $\frac{dy}{dx}$ when $x^2+y^2=2axy$.	**3**	**2**
11.	Find the first order partial derivatives of $u=e^{2x}y^2z^3$.	**3**	**2**
12.	If $x^y+y^x=c$ find $\frac{dy}{dx}$.	**3**	**2**
13.	Find the average value of $f(x)=x^3$ in the interval $[1,2]$	**4**	**2**
14.	An electric current i is given by the expression $i=L\cos\theta$ where L is constant. Find RMS value of current over the interval $0\le\theta\le2\pi$.	**4**	**2**
15.	Evaluate $\int\frac{(\log x)^2}{x}\,dx$	**4**	**2**
16.	Evaluate $\int x^2\,e^{2x}\,dx$	**4**	**2**
17.	Change the order of integration for $\int_0^a\int_0^y f(x,y)dydx$	**5**	**2**

18.	Evaluate $\int_0^2 \int_0^3 e^{3x} dydx$	**5**	**2**	
19.	Sketch the region of integration for $\int_0^\infty \int_0^\infty f(x,y)dydx$	**5**	**2**	
20.	Evaluate $\int_0^a \int_0^b \int_0^c (xyz)\, dzdydx$	**5**	**2**	

PART- B (5 x 10 = 50 Marks)

		Marks	CO	RBT LEVEL
21. (a)	Find the equation of the right circular cone whose vertex is at the origin, whose axis is the line $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$, and which has semi-vertical angle of 30°.	**(10)**	**1**	**3**
	(OR)			
(b)	Find the equation of the sphere through the circle $x^2 + y^2 + z^2 + 2x + 3y + 6 = 0; x - 2y + 4z - 9 = 0$ and the centre of the sphere $x^2 + y^2 + z^2 - 2x + 4y - 6z + 5 = 0$	**(10)**	**1**	**3**
22. (a)	If $y = \sin(\sin x)$ then prove that $\frac{d^2y}{dx^2} + \tan x \frac{dy}{dx} + y\cos^2 x = 0$	**(10)**	**2**	**3**
	(OR)			
(b)	If $y = e^{a \sin^{-1} x}$ then prove that $(1 - x^2)y_{n+2} - 2(n+1)xy_{n+1} - (n^2 + a^2)y_n = 0$	**(10)**	**2**	**3**
23. (a)	If z is a function of x and y and u and v are other two variables, such that $u = lx + my,\ v = ly - mx$. Show that $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = (l^2 + m^2)\left(\frac{\partial^2 z}{\partial u^2} + \frac{\partial^2 z}{\partial v^2}\right)$.	**(10)**	**3**	**3**
	(OR)			
(b)	Find the extreme values of the function $f(x,y) = x^3 + y^3 - 3x - 12y + 20$	**(10)**	**3**	**3**
24. (a)	Find the first and second moment of area under $y = 1 + x + x^2$ from $x = 0$ to $x = 2$ about $y - axis$.	**(10)**	**4**	**3**
	(OR)			
(b)	Find the centroid of the region bounded by $y = x^2$ and $y = \sqrt{x}$.	**(10)**	**4**	**3**
25. (a)	Find the area of the circle $x^2 + y^2 = a^2$	**(10)**	**5**	**3**
	(OR)			
(b)	Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \frac{1}{\sqrt{1-x^2-y^2-z^2}} dzdydx$	**(10)**	**5**	**3**

PART- C (1 x 10 = 10 Marks)

(Q.No.26 is compulsory)

		Marks	CO	RBT LEVEL
26.	Find the maximum value of $x^m y^n z^p$ subject to the condition $x + y + z = a$.	**(10)**	**3**	**3**