Q. Code:672880

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

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

First Semester

MA18152 – MATHEMATICS FOR MARINE ENGINEERING-I

(Marine Engineering)

(Regulation 2018/2018A)

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	Use rules of differentiation to differentiate functions.	**3**
CO 3	Apply differentiation to solve maxima and minima 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 (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Find the centre and radius of the sphere $x^2+y^2+z^2-4x-8y-12z-2=0$	**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 $\frac{dy}{dx}$ if $y=\tan[\log(\tan x)]$	**2**	**2**
4.	Find the n[th] derivative of $\cos(2x+3)$.	**2**	**2**
5.	A flat circular plate is heated so that the temperature at any point (x,y) is $u(x,y)=x^2+2y^2-x$. Find the coldest point on the plate.	**3**	**2**
6.	Find $\frac{dy}{dx}$ when $x^3+y^3=3axy$.	**3**	**2**
7.	Evaluate $\int \frac{(\log x)^2}{x}dx$	**4**	**2**
8.	Find the RMS value of $f(x)=1+x^2$ in the interval $[-1,2]$	**4**	**2**
9.	Evaluate $\int_0^3\int_0^2\int_0^1 z\,dz\,dy\,dx$	**5**	**2**

		Marks	CO
10.	Sketch the region of integration for $\int_0^a \int_x^a f(x,y)\,dy\,dx$	5	2

PART- B (5 x 14 = 70 Marks)

			Marks	CO	RBT LEVEL
11. (a)	**(i)**	Find the equation of the right circular cone whose vertex is the point $(2,1,-3)$, whose axis is parallel to OY and whose semi-vertical angle is 45°	**(7)**	**1**	**3**
	(ii)	Show that the plane $2x-2y+z+12=0$ touches the sphere $x^2+y^2+z^2-2x-4y+2z=3$ and hence find their point of contact.	**(7)**	**1**	**3**
		(OR)			
(b)	**(i)**	Find the equation of the sphere having the circle $x^2+y^2+z^2+10y-4z-8=0$, $x+y+z=3$ as a great circle	**(7)**	**1**	**3**
	(ii)	Find the equation of the right circular cylinder whose axis is $\frac{x}{2}=\frac{y}{3}=\frac{z}{6}$ and radius is 5.	**(7)**	**1**	**3**
12. (a)	**(i)**	Find the n[th] derivative of $\sin h2x \sin 4x$	**(7)**	**2**	**3**
	(ii)	If $y=a\cos(logx)+b\sin(logx)$ then prove that $x^2y_2+xy_1+y=0$.	**(7)**	**2**	**3**
		(OR)			
(b)	**(i)**	Find the Maclaurin's series expansion of $\sin^2 x$ in powers of x as far fra as the terms containing x^6 .	**(7)**	**2**	**3**
	(ii)	Trace the curve $y^2(2a-x)=x^3$.	**(7)**	**2**	**3**
13. (a)	**(i)**	If $z=f(x,y)$ where $x=rcos\theta$ and $y=rsin\theta$, prove that $\left(\frac{\partial z}{\partial x}\right)^2+\left(\frac{\partial z}{\partial y}\right)^2=\left(\frac{\partial z}{\partial r}\right)^2+\frac{1}{r^2}\left(\frac{\partial z}{\partial \theta}\right)^2$	**(7)**	**3**	**3**

			Marks	CO	RBT
	(ii)	Find the maximum value of $x^m y^n z^p$ subject to the condition $x+y+z=a$.	(7)	3	3
		(OR)			
(b)	**(i)**	If $w=f(y-z, z-x, x-y)$, prove that $\frac{\partial w}{\partial x}+\frac{\partial w}{\partial y}+\frac{\partial w}{\partial z}=0$.	(7)	3	3
	(ii)	Find the extreme values of the function $f(x,y)=x^3+y^3-3x-12y+20$	(7)	3	3
14. (a)	**(i)**	Find the first and second moment of area under $y=1+x+x^2$ from $x=0$ to $x=2$ about y-*axis*.	(7)	4	3
	(ii)	Find the volume of the sphere with radius 'a'.	(7)	4	3
		(OR)			
(b)	**(i)**	Evaluate as $\int_0^1 x^3 dx$ as limit of sums.	(7)	4	3
	(ii)	Find the centroid of the region bounded by $y=x^3$ and $y=\sqrt{x}$.	(7)	4	3
15. (a)	**(i)**	Evaluate $\iiint (x^2+y^2+z^2)\, dx\, dy\, dz$ taken over the volume enclosed by the sphere $x^2+y^2+z^2=a^2$ by transforming into spherical polar co-ordinates.	(7)	5	3
	(ii)	Change the order of integration and hence evaluate $\int_0^1 \int_{x^2}^{2-x} xy\, dy\, dx$	(7)	5	3
		(OR)			
(b)	**(i)**	Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \frac{1}{\sqrt{1-x^2-y^2-z^2}} dzdydx$	(7)	5	3
	(ii)	Find the area common to $y^2=4ax$ and $x^2=4ay$ using double Integration.	(7)	5	3

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	If z is a function of x and y and u and v are two other variables, such that $u=lx+my$, $v=ly-mx$, show that	(10)	3	3

$$\frac{\partial^2 z}{\partial x^2}+\frac{\partial^2 z}{\partial y^2}=\left(l^2+m^2\right)\left(\frac{\partial^2 z}{\partial u^2}+\frac{\partial^2 z}{\partial v^2}\right).$$

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