BT MRE-I(R/S)-12-24-3593 Reg. No. | | | | | | | | |

C

B.Tech. Degree I Semester Regular/Supplementary Examination in Marine Engineering December 2024

19-208-0101 ENGINEERING MATHEMATICS - I
(2019 Scheme)

Time: 3 Hours Maximum Marks: 60

Course Outcome
On successful completion of the course, the students will be able to:
CO1: Apply parabola, ellipse and hyperbola in engineering disciplines.
CO2: Use differential calculus and integral calculus for solving engineering problems.
CO3: Estimate the maxima and minima of multi variable functions.
CO4: Find area as double integrals and volume as triple integrals in engineering applications.
CO5: Apply vector methods in solving engineering problems.
Bloom's Taxonomy Levels (BL): L1 – Remember, L2 – Understand, L3 – Apply, L4 –Analyze, L5 – Evaluate, L6 – Create
PI – Programme Indicators

(Answer *ALL* questions) (5 × 15 = 75)

			Marks	BL	CO	PI
I.	(a)	Derive the standard equation of Parabola $y^2 = 4ax$.	7	L3	1	1
	(b)	Find the condition for $1x+my+n=0$ to be a tangent to the parabola $y^2 = 4ax$.	8	L3	1	1
		OR				
II.	(a)	Find the vertex, focus, directrix and axis of the parabola $2x^2+5y-3x+4=0$.	8	L3	1	1
	(b)	Derive the standard equation of ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$.	7	L2	1	1
III.	(a)	Verify Lagrange's Mean value theorem for $\log(x)$ in the interval [1, e].	8	L2	2	1
	(b)	Using Maclaurin's series, obtain the expansions of $\log(1+x)$ up to the term containing x^4.	7	L3	2	1
		OR				
IV.	(a)	Evaluate $\lim_{x\to 0}(\mathrm{Sin}\,x)^{\tan x}$.	8	L3	2	1
	(b)	Find the area enclosed between one arch of the cycloid $x=a(\theta-S\sin\theta)$. $y=a(1-\mathrm{Cos}\,\theta)$ and its base.	7	L3	2	1
V.	(a)	Find the nth derivative of $\frac{10x-21}{(2x-3)(2x+5)}$.	7	L3	3	1
	(b)	If $y=\mathrm{Sin}(m\,\mathrm{Sin}^{-1}x)$ prove that $(1-x^2)\frac{d^2y}{dx^2}-x\frac{dy}{dx}+m^2y=0$.	8	L3	3	1
		OR				

(P.T.O.)

			Marks	BL	CO	PI
VI.	(a)	Use Euler's theorem on homogeneous functions to prove that if, $u=\frac{x^3+y^3}{x-y}$ then $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=2u$	7	L3	3	1
	(b)	Discuss the maxima and minima of $f(x,y)=x^3+y^3-3x-12y+20=0$.	8	L3	3	1
VII.	(a)	Evaluate $\int_0^5\int_0^{x^2} x(x^2+y^2)\,dxdy$.	8	L3	4	1
	(b)	Find the volume of the ellipsoid $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$.	7	L3	4	1
		OR				
VIII.	(a)	Evaluate $\int_{-1}^{1}\int_0^z\int_{x-z}^{x+z}(x+y+z)\,dxdydz$.	8	L2	4	1
	(b)	Show that the vectors $\left(\bar{a}-2\bar{b}+\bar{c}\right)$, $(-2\bar{a}+3\bar{b}-4\bar{c})$, $(-\bar{b}+2\bar{c})$ are coplanar.	7	L3	4	1
IX.	(a)	A vector field is given by $F=(x^2-y^2+x)i-(2xy+y)j$. Show that the field is irrotational and find its scalar potential.	7	L3	5	1
	(b)	Find the directional derivative of xy^2+yz^3 at (2,-1,1) in the direction of the vector $i+2j+2k$.	8	L3	5	1
		OR				
X.	(a)	Find a unit vector normal to the surface $xy^3z^2=4$ at the point $(-1,-1,2)$.	7	L5	5	1
	(b)	Verify Green's theorem for $\int_c\left[(xy+y^2)dx+x^2dy\right]$, where C is bounded by $y=x$ and $y=x^2$.	8	L5	5	1

Bloom's Taxonomy Levels
L2 – 15%, L3 – 75%, L5 – 10%.

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