BT MRE-I(R/S)-11-22-2013 Reg. No. [ ]

C

B.Tech. Degree I Semester Regular/Supplementary Examination in Marine Engineering November 2022

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

PO – Programme Outcome

		Question	Marks	BL	CO	PO
		(5 × 15 = 75)				
I.	(a)	Find the equation to the parabola whose focus is the point (3,4) and directrix is the straight line $2x-3y+5=0$.	7	L3	1	1.1.1
	(b)	Derive the standard equation of hyperbola.	8	L3	1	1.1.1
		OR				
II.	(a)	Show that the tangents at the extremities of a focal chord intersect at right angles on the directrix.	8	L3	1	1.1.1
	(b)	Find the focus and length of latus rectum of the ellipse $\frac{x^2}{4}+\frac{y^2}{3}=1$.	7	L2	1	1.1.1
III.	(a)	Evaluate: (i) $\underset{x\to 0}{Lt}\frac{xe^x-\log(1+x)}{x^2}$ (ii) $\underset{x\to 0}{Lt}\left(\frac{a^x+b^x+c^x}{3}\right)^{\frac{1}{x}}$.	8	L2	2	1.1.1
	(b)	A rectangular sheet of metal of length 6 metres and width 2 metres is given. Four equal squares are removed from the corners. The sides of this sheet are now turned up to form an open rectangular box. Find approximately the height of the box such that the volume of the box is maximum.	7	L3	2	1.1.1
		OR				
IV.	(a)	Integrate $\int \sin^4 x\cos^2 x\,dx$.	8	L3	2	1.1.1
	(b)	Find the perimeter of the loop of the curve $3ay^2 = x(x-a)^2$.	7	L3	2	1.1.1

(P.T.O.)

			Marks	BL	CO	PO
V.	(a)	If $y=\sin^{-1}x$ prove that $(1-x^2)y_{n+2}-(2n+)xy_{n+1}-n^2y_n=0$.	7	L3	3	1.1.1
	(b)	State Leibnitz theorem and find the n[th] derivative of $x^2\log 3x$.	8	L3	3	1.1.1
		OR				
VI.	(a)	If $\sin u=\dfrac{x^2y^2}{x+y}$ show that $x\dfrac{\partial u}{\partial x}+y\dfrac{\partial u}{\partial y}=3\tan u$.	7	L3	3	1.1.1
	(b)	If $u=x^2-2y^2, v=2x^2-y^2$ where $x=r\cos\theta, y=r\sin\theta$ show that $\dfrac{\partial(u,v)}{\partial(r,\theta)}=6r^3\sin 2\theta$.	8	L3	3	1.1.1
VII.	(a)	Find the area lying inside the circle $r=a\sin\theta$ and outside the cardioid $r=a(1-\cos\theta)$.	8	L3	4	1.1.1
	(b)	Find the volume enclosed by the cylinders $x^2+y^2=2ax$ and $z^2=2ax$.	7	L3	4	1.1.1
		OR				
VIII.	(a)	Prove that the vectors $i-2j+3k, -2i+3j-4k$ and $i-3j+5k$ are coplanar.	7	L2	4	1.1.1
	(b)	(i) Show that $I\times(R\times I)+J\times(R\times J)+K\times(R\times K)=2R$. (ii) Find the vectors reciprocal to the set $-i+2j+2k., 2i+3j+k, i-j-2k$.	8	L3	4	1.1.1
IX.	(a)	The temperature of points in space is given by $T(x,y,z)=x^2+y^2-z$. A mosquito located at (1, 1, 2) desires to fly in such a direction that it will get warm as soon as possible. In what direction should it move?	7	L5	5	1.1.1
	(b)	Show that $\operatorname{div}(\operatorname{grad} r^n)=\nabla^2(r^n)=n(n+1)r^{n-2}$.	8	L3	5	1.1.1
		OR				
X.	(a)	State Green's theorem and verify for $\int_c (3x-8y^2)dx+(4y-6xy)dy$ where C is the boundary of the region bounded by $x=0, y=0$ and $x+y=1$.	7	L3	5	1.1.1
	(b)	Evaluate $\int_S F\cdot ds$ where $F=4xi-2y^2j+z^2k$ and S is the surface bounding the region $x^2+y^2=4$ $z=0$ and $z=3$.	8	L5	5	1.1.1

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

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