B.Tech. Degree II Semester Regular/Supplementary Examination in Marine Engineering June 2022

19-208-0201 ENGINEERING MATHEMATICS II
(2019 Scheme)

Time: 3 Hours   Maximum Marks: 60

Course Outcome
On successful completion of the course, the students will be able to:

CO1:   Solve linear system of equations and to determine eigen values and vectors of a matrix.
CO2:   Solve ordinary differential equations and linear differential equations of higher order with constant coefficient and apply them in engineering problems.
CO3:   Determine Fourier series expansion of functions and transform.
CO4:   Solve linear differential equation and integral equation using Laplace transform.
CO5:   Understand the basic concepts of probability and different probability distribution.
Bloom's Taxonomy Levels (BL): L1 – Remember, L2 – Understand, L3 – Apply, L4 –Analyze,
L5 – Evaluate, L6 – Create
PO – Programme Outcome

			(5 × 15 = 75)	Marks	BL	CO	PO
I.		If $A = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$ find the eigen values and eigen vectors for (i) A^T (ii) A^{-1} (iii) A^2.		15	L4	1	2.4.1

OR

II.	(a)	Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$ to the canonical form and specify the nature of transformation.	8	L3	1	2.4.1
	(b)	Solve $4x + 2y + z + 3w = 0$, $6x + 3y + 4z + 7w = 0$, $2x + y + w = 0$.	7	L2	1	2.4.1

III.	(a)	Solve $\dfrac{dy}{dx} + \dfrac{2y}{x} = y^2 x^2$.	10	L2	2	2.4.1
	(b)	Newton's law of cooling states that the rate of change of temperature of a body with time (rate of cooling) is proportional to the difference of temperature between the body and that of its surroundings. Form a differential equation representing the above phenomena.	5	L3	2	2.4.1

OR

IV.	(a)	Solve $\dfrac{d^2 y}{dx^2} - 3\dfrac{dy}{dx} + 2y = xe^{3x} + \sin 2x$.	7	L2	2	2.4.1
	(b)	Solve the simultaneous equations $\dfrac{dx}{dt} + 2y + \sin t = 0$, $\dfrac{dy}{dt} - 2x - \cos t = 0$, Given that $x = 0$, $y = 1$ when $t = 0$.	8	L2	2	2.4.1

V.		An alternating current after passing through a rectifier has the form $I = \begin{cases} I_0 \sin x & \text{for } 0 \le x \le \pi \\ 0 & \text{for } \pi \le x \le 2\pi \end{cases}$, where I_0 is maximum current and the period is 2π. Express I as a Fourier series.	15	L4	3	2.4.1

OR

B

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			Marks	BL	CO	PO
VI.	(a)	Prove that $\beta\left(m,\dfrac{1}{2}\right)=2^{2m-1}\beta(m,m)$.	8	L2	3	2.4.1
	(b)	Is there any relation between beta and gamma functions? If yes prove the same.	7	L2	3	2.4.1
VII.	(a)	If $f(t)=\begin{cases}\sin t & 0<t<\pi \\ 0 & t>\pi\end{cases}$, then find $L(f(t))$.	7	L3	4	2.4.1
	(b)	Solve by the method of transforms 1the equation $y'''+2y''-y'=2y=0$ given $y(0)=y'(0)=0$ and $y''(0)=6$.	8	L4	4	2.4.1

OR

VIII.		Show that $L^{-1}\left(\dfrac{1}{\left(s^2+a^2\right)^2}\right)=\dfrac{1}{2a^3}(\sin at - at\cos at)$.	15	L3	4	2.4.1
IX.		Out of 800 families with 5 children to each how many would you expect to have (i) 3 boys (ii) 5 girls (iii) either 2 or 3 boys. Assume equal probabilities for boys and girls.	15	L3	5	2.4.1

OR

X.		In a bolt factory machines A, B and C manufacture respectively 25%, 35% and 40% of total. Of their output 5, 4 and 2 percent are defective bolts. A bolt is drawn at random from the product and is found to be defective. What is the probability that it was manufactured by machine B?	15	L3	5	2.4.1

Bloom's Taxonomy Levels
L2 = 32%, L3 =43%, L4 = 25%

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