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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Second Semester, B. E. - Semester End Examination; August - 2023

Engineering Mathematics - II

(Common to All Branches)

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: Understand the basic concept of matrix and solve the problems

CO2: Distinguish homogeneous and non-homogenous differential equations.

CO3: Explain or solve Laplace transform of the functions

CO4: Solve Double and Triple integral of the functions

***Note**: **I) PART-A** is compulsory. **Two** marks for each question.*

***II) PART-B**: Answer any **Two** sub questions (from a, b, c) for a Maximum of **18 marks** from each unit.*

Q. No.	Questions	Marks	BLs	COs	POs
	I :PART - A	**10**			
1 a.	Find the rank of the matrix $A=\begin{bmatrix}1&2&3\\1&4&2\\2&6&5\end{bmatrix}$.	2	L1	CO1	PO1
b.	Find the particular integral of $\frac{d^2y}{dx^2}-6\frac{dy}{dx}+9x=5e^{-2x}$.	2	L1	CO2	PO1
c.	Find $L\left\{te^{2t}\right\}$.	2	L1	CO3	PO1
d.	If $x=r\cos\theta,\ y=r\sin\theta,$ find $J\left(\frac{x,y}{r,\theta}\right)$.	2	L1	CO4	PO1
e.	Write the relationship between beta and gamma functions with usual notations.	2	L2	CO5	PO1
	II : PART - B	**90**			
	UNIT - I	**18**			
2 a.	Determine the values of λ and μ for which the system $x+y+z=6,\ x+2y+3z=10$ and $x+2y+\lambda z=\mu$ has; i) Unique solution ii) Infinitely many solutions iii) No solution	9	L1	CO1	PO
b.	Find all the Eigen values and the corresponding Eigen vectors of the matrix, $A=\begin{bmatrix}-2&2&-3\\2&1&-6\\-1&-2&0\end{bmatrix}$	9	L2	CO1	PO1
c.	Reduce the quadratic form $x_1^2+3x_2^2+3x_3^2-2x_2x_3$ to the canonical form by an orthogonal transformation.	9	L3	CO1	PO2

Contd…2

	UNIT - II	**18**			
3 a.	i) Solve: $\frac{d^2y}{dx^2}-4\frac{dy}{dx}+13y=\cos x$ ii) Solve: $\frac{d^2y}{dx^2}+2\frac{dy}{dx}+y=2x+x^3$	9	L2	CO2	PO1
b.	Solve $\frac{d^2y}{dx^2}+y=\sec x\tan x$ by method of variation of parameters.	9	L2	CO2	PO1
c.	Solve: $(3x+x)^2\,y''+3(3x+2)\,y'-36y=8x^2+4x+1$	9	L2	CO2	PO2
	UNIT - III	**18**			
4 a.	Find; i) $L[t\cos at]$ ii) $L\left\{\frac{\cos at-\cos bt}{t}\right\}$	9	L2	CO3	PO2
b.	Express $f(t)=\begin{cases}\sin t, & 0\le t<\pi\\ \sin 2t, & \pi\le t<2\pi\\ \sin 3t, & t\ge 2\pi\end{cases}$ in terms of unit step functions and hence find $L[f(t)]$	9	L3	CO3	PO2
c.	i) Find $L^{-1}\left(\cos^{-1}\left(\frac{s+a}{b}\right)\right)$ ii) Evaluate $L^{-1}\left[\frac{s^2}{s^2+a^2}\right]$ using convolution theorem.	9	L1	CO3	PO2
	UNIT - IV	**18**			
5 a.	If $x=u(1-v),\ y^{-18}=uv$ find J=$\frac{\partial(x,y)}{\partial(u,v)}$ and $J'=\frac{\partial(u,v)}{\partial(x,y)}$ hence show that JJ′=1	9	L2	CO4	PO2
b.	The temperature T at a point (x, y, z) in space is T = 400 xyz^2. Find the highest temperature on the surface of the unit sphere $x^2+y^2+z^2=1$.	9	L3	CO4	PO2
c.	Verify Stoke's theorem for $\vec{F}=(2x-y)\hat{i}-yz^2\hat{j}-y^2z\hat{k}$, where S is the upper half surface of the sphere $x^2+y^2+z^2=1$, C is its boundary.	9	L2	CO4	PO1
	UNIT - V	**18**			
6 a.	Evaluate: $\int_0^1\int_0^{\sqrt{1-x^2}}\int_0^{\sqrt{1-x^2-y^2}}\frac{dz\,dy\,dx}{\sqrt{1-x^2-y^2-z^2}}$	9	L1	CO4	PO1
b.	Apply changing the order of integration evaluate $\int_0^4\int_{x^2/4a}^{2\sqrt{ax}} xy\,dydx.$	9	L2	CO4	PO2
c.	Show that: $\int_0^1\frac{x^2}{\sqrt{1-x^4}}dx\times\int_0^1\frac{dx}{\sqrt{1+x^4}}=\frac{\pi}{4\sqrt{2}}$.	9	L3	CO4	PO2

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