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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; October - 2022

Engineering Mathematics - II

(Common to all Branches)

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1 - Explain linear system of equations, Eigen values/vectors similarity and diagonalisation of matrices.

CO2 - Solve linear second order differential equations. Evaluate Laplace transforms and inverse Laplace transforms.

CO3 - Evaluate the Jacobians, and the Taylors series expansion and find the extreme value.

CO4 - Analyse the vector integration to use in the study of line integrals.

CO5 - Evaluate the multiple integrals and Evaluate application oriented problems.

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 $A=\begin{bmatrix}1 & 4\\ 3 & 13\end{bmatrix}$.	2	L1	CO1	PO1
b.	Solve $(D^2-3D+2)y=0$.	2	L1	CO2	PO1
c.	Find $L[t\cos at]$.	2	L1	CO3	PO1
d.	Determine all critical points for the function $x^3+y^2-3x-4y$.	2	L1	CO4	PO1
e.	Evaluate $\int_0^1\int_0^1 (x+y)\,dydx$.	2	L1	CO5	PO1
	II : PART - B	**90**			
	UNIT - I	**18**			
2 a.	Investigate the values of λ and μ such that the system of equations $x+y+z=6,\quad x+2y+3z=10,\quad x+2y+\lambda z=\mu,$ may have; i) Unique solution ii) Infinite solution iii) No solution	9	L3	CO1	PO1
b.	Solve by L-U decomposition method : $2x+y+z=10,\quad 3x+2y+3z=18,\quad x+4y+9z=16.$	9	L3	CO1	PO2
c.	Define the Eigen value and Eigen vector of a matrix. Reduce the quadratic form $8x^2+7y^2+3z^2-12xy+4zx-8yz$ into the canonical form.	9	L2	CO1	PO2
	UNIT - II	**18**			
3 a.	i) Define Homogeneous linear differential equations. ii) Solve : $(4D^4-8D^3-7D^2+11D+6)y=0$.	9	L2	CO2	PO1
b.	Solve : $(D^4+8D^2+16)y=2\cos^2 x$.	9	L2	CO2	PO2
c.	Solve: $\frac{d^2y}{dx^2}+y=\tan x$ by the method of variation of parameters	9	L3	CO2	PO2

	UNIT - III	**18**		
4 a.	Find the Laplace transform of; $i)\left(\sqrt{t}-\frac{1}{\sqrt{t}}\right)^3$ $ii)\ e^{3t}\sin 5t\sin 3t$	9	L2	CO3 PO1
b.	Show that the Laplace transform of the function, $f(t)=\begin{cases}1 & 0<t<\frac{a}{2}\\ -1 & \frac{a}{2}<t<a\end{cases}$ where $f(t+a)=f(t)$ is $\frac{1}{s}\tanh\left(\frac{as}{4}\right)$.	9	L3	CO3 PO1
c.	Solve : $Y'''+2y''-y'-2y=0$ given $y(0)=y'(0)=0$ *and* $y''(0)=6$ by using Laplace transform method.	9	L3	CO3 PO2
	UNIT - IV	**18**		
5 a.	Define Jacobean of functions in three variables. If $u=\sqrt{x_1x_2}, v=\sqrt{x_2x_3}, w=\sqrt{x_3x_1}$ then determine $\frac{\partial(u,v,w)}{\partial(x,y,z)}$.	9	L2	CO4 PO1
b.	The temperature T at any point (x, y, z) in space is $T=400\,xyz^2$. Find the highest temperature at the surface of the unit sphere $x^2+y^2+z^2=1$.	9	L3	CO4 PO2
c.	State Green's theorem. Verify Stokes theorem for the vector $\vec{F}=(x^2+y^2)i-2xyj$ taken round the rectangle bounded by $x=0, x=a$, $y=0$ and $y=b$.	9	L2	CO4 PO2
	UNIT - V	**18**		
6 a.	Evaluate : $\int_0^a\int_0^{\sqrt{a^2-x^2}}\int_0^{\sqrt{a^2-x^2-y^2}}\frac{dz\,dy\,dx}{\sqrt{a^2-x^2-y^2-z^2}}$.	9	L2	CO5 PO1
b.	Evaluate $\iint_R xy\,dxdy$ where R is the region bounded by the lines $y = x$, $y = 0$ and the line $x + y = 2$.	9	L3	CO5 PO2
c.	Define Gamma function. Show that $\int_0^{\frac{\pi}{2}}\sin^p\theta.\,d\theta\times\int_0^{\frac{\pi}{2}}\sin^{p+1}\theta.\,d\theta=\frac{\pi}{2(p+1)}$.	9	L2	CO5 PO1

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