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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; July / August - 2022

Engineering Mathematics - II

(Common to All Branches)

Time: 3 hrs *Max. Marks: 100*

Course Outcome's

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. One question from each unit for maximum of 2 marks.*
*ii) **PART-B**: Answer any **TWO** sub questions (from a, b, c) from each unit for a Maximum of 18 marks.*

Q. No.	Questions	Marks	BLs	COs	POs
	I: PART - A	**10**			
1 a.	Write the matrix corresponding to the quadratic form $4x^2-2y^2+z^2-2xy+6zx$	2	L1	CO1	PO1
b.	What is the particular integral of $\left(D^2-4D+4\right)y=e^{2x}$	2	L1	CO2	PO1
c.	Find the inverse Laplace transform of $\dfrac{s+3}{s^2-4s+13}$	2	L1	CO3	PO1
d.	State Gauss divergence theorem.	2	L1	CO4	PO1
e.	Define Beta and Gamma functions.	2	L1	CO4	PO1
	II: PART - B	**90**			
	UNIT - I	**18**			
1 a.	For what values of K the equations $x+y+z=1,\ 2x+y+4z=K,\ 4x+y+10z=k^2$ have a solution and solve them completely in each case	9	L2	CO1	PO1
b.	Solve the system of equations $2x+y+4z=12,\ 4x+11y-z=33,\ 8x-3y+2z=20$ Using LU decomposition method.	9		CO1	PO2
c.	Reduce the matrix $A=\begin{bmatrix}-19 & 7\\ -42 & 16\end{bmatrix}$ to the diagonal form.	9	L2	CO1	PO2
	UNIT - II	**18**			
2 a.	i) Solve: $y''+4y+5y=0$ given that $y=2$ and $y'=0$ when $x=0$ ii) Solve: $\left(D^2+5D+6\right)y=e^{-2x}\sin 2x$	9	L2	CO2	PO1
b.	Solve $\left(D^2-2D+2\right)y=e^x\tan x$ by method of variation of parameters.	9	L2	CO2	PO2
c.	Solve: $(x+1)^2\,y''+(x+1)\,y'+y=4\cos\left[\log(x+1)\right]$	9	L2	CO2	PO3

Contd....2

UNIT – III (18)

3 a. Find Laplace transform of, (9, L1, CO3, PO1)

i) $t^2 \cos at$ ii) $\frac{e^{-t}\sin t}{t}$

b. i) Write the formula for the Laplace transform of periodic function f(t) period T.

ii) Express: $f(t)=\begin{cases}\cos t, & 0<t<\pi \\ \cos 2t, & \pi<t<2\pi \\ \cos 3t, & t>2T\end{cases}$ interms of unit step function and hence find, $L\{f(t)\}$. (9, L2, CO3, PO2)

c. i) Find the inverse Laplace transform of $\cot^{-1}\left(\frac{s+a}{b}\right)$

ii) Find the inverse laplace transform of $\frac{1}{(s^2+a^2)^2}$ using convolution theorem. (9, L3, CO3, PO2)

UNIT - IV (18)

4 a. i) Find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$ if $u=x+y^2-3z^3,\ \ V=4x^2yz,\ x=2z^2-xy$ at (1, -1, 0)

ii) Obtain the Taylor's expansion of $e^x\sin y$ about the point $\left(0,\pi/2\right)$ upto second degree terms. (9, L2, CO4, PO2)

b. i) Write the necessary and sufficient conditions for f(x, y) to have a maximum and minimum values at (a, b).

ii) The temperature T at point (*x, y, z*) in space is T = 400 xyz^2. Find the highest temperature at the surface of the unit sphere $x^2+y^2+z^2=1$ using Lagrange method. (9, L2, CO4, PO2)

c. Verify Green's theorem for $\int_e (xy+y^2)dx+x^2dy$ Where C id the closed curve bounded by the line y = x and the parabola y = x^2. (9, L3, CO4, PO2)

UNIT - V (18)

5 a. i) Evaluate: $\int_0^1\int_x^{\sqrt{x}} xy\,dy\,dx$ ii) $\int_0^1\int_0^x\int_0^{x+y} e^{x+y+z}dz\,dy\,dx$ (9, L2, CO4, PO1)

b. Evaluate $\int_0^1\int_{x^2}^{2-x} xy\,dy\,dx$ by changing the order of integration. (9, L3, CO4, PO2)

c. i) Find the area of the first quadrant of the circle $x^2+y^2=a^2$ by double integration

ii) Evaluate $\int_0^{\pi/2}\sqrt{\tan\theta}\,d\theta$ using Beta function. (9, L3, CO4, PO2)

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