PVP 23

Code: 23BS1101

I B.Tech - I Semester – Supplementary Examinations – MAY 2025

LINEAR ALGEBRA & CALCULUS

(Common for ALL BRANCHES)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
4. All parts of Question paper must be answered in one place.

PART – A

1.a)	Define Normal form.
1.b)	Write Consistency conditions for Homogeneous linear system of equations.
1.c)	If $A=\begin{bmatrix} -1 & 2 & 3 \\ 0 & 3 & 5 \\ 0 & 0 & -2 \end{bmatrix}$, then find the eigen values of A^{-1}
1.d)	Verify Cayley-Hamilton theorem for $\begin{bmatrix} 5 & 3 \\ 3 & 2 \end{bmatrix}$.
1.e)	State Cauchy Mean Value Theorem.
1.f)	Write the Taylor's Series of cosx about $\frac{\pi}{4}$.
1.g)	Define Jacobian of 3 variables.
1.h)	If $x=r\cos\theta,\ y=r\sin\theta$, show that $\frac{\partial(x,y)}{\partial(r,\theta)}=r$.
1.i)	Evaluate $\int_1^2\int_1^3 xy^2\,dxdy$
1.j)	Write the formula to find volume in Cartesian form.

PART – B

					Max. Marks
UNIT-I					
2	a)	Find rank by reducing $\begin{bmatrix} -2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$ into Echelon form.			5 M
	b)	Solve $x+y+z = 6$; $x-y+2z = 5$; $2x-2y+3z = 7$.			5 M
OR					
3	a)	Find rank of $A=\begin{bmatrix} 0 & 1 & 2 & -2 \\ 4 & 0 & 2 & 6 \\ 2 & 1 & 3 & 1 \end{bmatrix}$ by reducing into Echelon form.			5 M
	b)	Solve $10x_1 + x_2 + x_3 = 12$; $2x_1 + 10x_2 + x_3 = 13$; $2x_1 + 2x_2 + 10x_3 = 14$ by Gauss Seidel method.			5 M
UNIT-II					
4	a)	Find Eigen values and Eigen vectors of $A=\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$			5 M
	b)	Verify Cayley-Hamilton theorem for $A=\begin{bmatrix} 2 & 5 & 5 \\ 0 & 3 & 0 \\ 5 & 5 & 8 \end{bmatrix}$ and hence find A^{-1} and A^{4}.			5 M
OR					

5		Reduce the quadratic form $6x^2+3y^2+3z^2-4xy+4xz-2yz$ in to canonical form by orthogonal transformation method. Find Index, Rank, Signature, Nature of the quadratic form.	10 M
		UNIT-III	
6	a)	Verify Rolle's theorem for the function $f(x)=x^3-4x+8$ in the interval $[-2,2]$.	5 M
	b)	Expand $Sin\,x$ by Maclaurin's series up to the term containing x^5.	5 M
		OR	
7	a)	Find $\sqrt[5]{245}$ using Lagrange's mean value theorem.	5 M
	b)	Verify Cauchy's mean value theorem for the function $f(x)=\sqrt{x}, g(x)=\frac{1}{\sqrt{x}}$ in the interval $[a, b]$.	5 M
		UNIT-IV	
8	a)	If $x+y+z=u, y+z=uv, z=uvw$ then find $J\left(\frac{x,y,z}{u,v,w}\right)$.	5 M
	b)	Expand $Cos\,x\,Cos\,y$ in powers of x and y.	5 M
		OR	
9	a)	If $u=f[(y-z),(z-x),(x-y)]$ then show that $\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}+\frac{\partial u}{\partial z}=0$	5 M
	b)	In a plane triangle ABC, find the maximum value of $Cos\,A\,Cos\,B\,Cos\,C$.	5 M

		UNIT-V	
10	a)	Evaluate $\iint_R \frac{x^2y^2}{(x^2+y^2)}dx\,dy$ where R is the annular region between two circles $x^2+y^2=a^2$ and $x^2+y^2=b^2$ (b>a).	5 M
	b)	*Evaluate* $\int_0^1 \int_0^x e^{y/x}\,dy\,dx$	5 M
		OR	
11	a)	Evaluate $\iint_R xy(x+y)dx\,dy$, where R is the region bounded by $y=x^2$ and $y=x$	5 M
	b)	*Evaluate* $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)}dx\,dy$	5 M