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Code No. : 11201 S

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. I-Semester Supplementary Examinations, September-2022

Calculus & Linear Algebra

(Common to CSE, AIML & IT)

Time: **3 hours** Max. Marks: **60**

Note: Answer all questions from ***Part-A*** *and any* ***FIVE*** *from* ***Part-B***

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Define Radius of curvature and find the radius of curvature at the origin for the curve $y^4+x^3+a\,(x^2+y^2)-a^2y=0$.	2	2	1	1,2,12
2.	Obtain the Taylor's series expansion of $\sqrt{x}$ about $x=1$ up to the terms of 2^{nd} degree.	2	2	1	1,2,12
3.	Find $\frac{dy}{dx}$ by using Implicit function for the function $x^y+y^x=c$.	2	2	2	1,2,12
4.	Determine , $\lim_{(x,y)\to(0,0)} \frac{xy}{x^2+y^2}$.	2	1	2	1,2,12
5.	Define Co-ordinate of a vector point function.	2	1	3	1,2,12
6.	Define Vector Subspace .	2	1	3	1,2,12
7.	If the product of two eigen values of the matrix $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ is 16, then the third eigen value is	2	2	4	1,2,12
8.	State Cauchy-Schwartz inequality and Triangle inequality.	2	1	4	1,2,12
9.	Test the convergence of $\sum \frac{1}{(\log n)^n}$	2	2	5	1,2,12
10.	Define Absolute convergence and Conditional convergence of the alternating series.	2	1	5	1,2,12
	Part-B (5 × 8 = 40 Marks)				
11. a)	Find the radius of curvature at any point of the parabola $y^2=4ax$.	4	4	1	1,2,12
b)	Find the Evolute of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$	4	3	1	1,2,12
12. a)	Find the maximum value of $u(x,y,z)=x^2y^3z^4$ if $2x+3y+4z=a$	4	3	2	1,2,12
b)	Expand the function $e^x\log(1+y)$ in terms of x *and* y upto the terms of 3^{rd} degree.	4	3	2	1,2,12
13. a)	Let $V=\left\{\begin{bmatrix} a & b \\ c & 1 \end{bmatrix} \middle\vert a,b,c\in R\right\}$ .Define $\begin{bmatrix} a & b \\ c & 1 \end{bmatrix}\oplus\begin{bmatrix} d & e \\ f & 1 \end{bmatrix}=\begin{bmatrix} a+d & b+e \\ c+f & 1 \end{bmatrix}$ and $k\odot\begin{bmatrix} a & b \\ c & 1 \end{bmatrix}=\begin{bmatrix} ka & kb \\ kc & 1 \end{bmatrix}$ verify V is a vector space or not.	4	3	3	1,2,12

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	b)	Define the linear transformation $T: R^4 \rightarrow R^3$ *by* $T\left(\begin{bmatrix} a \\ b \\ c \\ d \end{bmatrix}\right) = \left(\begin{bmatrix} a+b \\ b-c \\ a+d \end{bmatrix}\right)$. Find a basis for the null space and range of T and its dimension.	4	3	3	1,2,12
14.	a)	Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & -1 \\ 1 & -1 & 0 \end{bmatrix}$	4	2	4	1,2,12
	b)	If $B = \left\{ \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} -1 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} -1 \\ 0 \\ 1 \end{bmatrix} \right\}$ be an ordered basis. Find an Orthonormal basis for R^3 by using Gram-Schmidt process.	4	2	4	1,2,12
15.	a)	Discuss the convergence of $\sum \frac{x^{2n}}{(n+2)(\sqrt{n+1})}$.	4	3	5	1,2,12
	b)	Test the series $\frac{1}{2^3} - \frac{1}{3^3}(1+2) + \frac{1}{4^3}(1+2+3) - \frac{1}{5^3}(1+2+3+4) + \cdots \infty$ for absolute convergence and conditional convergence.	4	3	5	1,2,12
16.	a)	Find the equation of the circle of curvature of the curve $y = x^2 - 6x + 10$ at (3,1).	4	2	1	1,2,12
	b)	If $z = f(x, y)$, where $x = e^u + e^{-v}, y = e^{-u} - e^v$. Show that $\frac{\partial z}{\partial u} - \frac{\partial z}{\partial v} = x\frac{\partial z}{\partial x} - y\frac{\partial z}{\partial y}$.	4	2	2	1,2
17.		Answer any ***two*** of the following:				
	a)	Let $T: R^2 \rightarrow R^3$ be the linear transformation defined by $T\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} x_2 \\ x_1 + x_2 \\ x_1 - x_2 \end{bmatrix}$ and let $= \left\{ \begin{bmatrix} 1 \\ 2 \end{bmatrix}, \begin{bmatrix} 3 \\ 1 \end{bmatrix} \right\}$, $B' = \left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} \right\}$ be ordered basis for R^2 *and* R^3 respectively. Find the matrix $[T]_B^{B'}$.	4	4	3	1,2,12
	b)	If $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 3 & 1 \\ 0 & 0 & 1 \end{bmatrix}$, then obtain the matrix P such that $P^{-1}AP$ is a diagonal matrix.	4	3	4	1,2,12
	c)	Test for convergence the series $\frac{1}{4.7.10} + \frac{4}{7.10.13} + \frac{9}{10.13.16} + \cdots \infty$	4	3	5	1,2,12

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	12%
ii)	Blooms Taxonomy Level – 2	32%
iii)	Blooms Taxonomy Level – 3 & 4	56%

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