ACE Engineering College

(with a Difference in Excellence)

An AUTONOMOUS Institution

Question Pape Code: MA101BS | ACE-R20

Supplementary Examination

I B. Tech- I Semester- November 2021

Mathematics - I (Linear Algebra and Calculus)

(Common To All Branches)

Time: 3 Hours **Max. Marks: 70**

H. T. No										

Answer any five full questions from the following. All Questions carry equal marks.

M=Marks; CO=Course Outcomes; PO= Program Outcomes

Q.No	Question	M	CO	PO
1. a)	Solve the system of equations $x+3y-2z=0$; $2x-y+4z=0$; $x-11y+14z=0$.	7	1	1,12
b)	Reduce the matrix $\begin{bmatrix} -2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$ to Echelon form and hence find the rank.	7	1	1,12
2. a)	Find the inverse of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$ by elementary row operations	7	1	2
b)	Solve the equations $10x_1+x_2+x_3=12$, $x_1+10x_2-x_3=10$, and $x_1-2x_2+10x_3=9$ by Gauss – Seidal iterative method.	7	1	1,2
3. a)	Find Eigen values and the corresponding Eigen vectors of $\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$.	7	2	1,2
b)	Discuss the nature of the quadratic form $x^2-y^2+4z^2+4xy+6xz+2yz$.	7	2	1,2,3
4. a)	Verify Cayley-Hamilton theorem for the matrix $A=\begin{bmatrix} 2 & 1 & 2 \\ 5 & 3 & 3 \\ -1 & 0 & -2 \end{bmatrix}$. Hence find A^{-1}.	7	2	2,12
b)	Show that the matrix $A=\begin{bmatrix} 2 & 3 & 4 \\ 0 & 2 & -1 \\ 0 & 0 & 1 \end{bmatrix}$ cannot be diagonalized	7	2	1,12

5. a)	Show that the sequence $\{a_n\}$ is converges to 0 where $a_n = \sqrt{n+1} - \sqrt{n}$.	7	3	1,3
b)	Find the sum of the series $$\sum_{n=0}^{\infty}\left(\frac{1}{2^n} + \frac{(-1)^n}{3^n}\right)$$	7	3	1,2
6. a)	Expand f (x, y) = 21x -20 y + 4 x^2 + x y + 6 y^2 in Taylor's series of maximum order about the point (-1,2).	7	4	1,3
b)	Prove that (i) $\beta(m,n) = \beta(m+1,n) + \beta(m,n+1)$ (ii) $\Gamma(n+1) = n\Gamma n$.	7	4	1,3
7. a)	If f = $tan^{-1}(\frac{y}{x})$ then find the values of f_x and f_y .	7	5	1,3
b)	If z is homogeneous function of degree n in x and y , show that $$x^2\frac{\partial^2 z}{\partial x^2} + 2xy\frac{\partial^2 z}{\partial x \partial y} + y^2\frac{\partial^2 z}{\partial y^2} = n(n-1)z$$	7	5	1,3
8. a)	Find $$\lim_{(x,y)\to(0,0)} \frac{x^2 y}{x^2 + y^2}$$	7	5	1,3
b)	Find the Absolute maximum and minimum values of f(x,y)=$4x^2 + 9y^2 - 8x - 12y + 4$.	7	5	1,3