ACE
Engineering College
(with a Difference in Excellence)
An AUTONOMOUS Institution

Question Paper Code: | MA101BS |

ACE-R20

Semester End Examination
I B. Tech- I Semester Regular/ Supply - JUNE-2022
Mathematics - I
(Common to all Branches)

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

| H. T. No | | | | | | | | | |

Answer any 5 Questions out of 8 Questions from the following

Q.No	Question	Marks
1. a)	Find the rank of the matrix $A=\begin{bmatrix} 1 & 1 & 0 \\ 0 & 0 & 1 \\ 2 & 2 & 2 \end{bmatrix}$	6M
b)	Reduce the matrix $A = \begin{bmatrix} 1 & -1 & 2 & -3 \\ 4 & 1 & 0 & 2 \\ 0 & 3 & 0 & 4 \\ 0 & 1 & 0 & 2 \end{bmatrix}$ to Normal form and Hence find its rank.	8M
2. a)	Discuss for what values of λ, μ the simultaneous equations $x + y + z = 6$, $x + 2y + 3z =10$, $x + 2y +\lambda z = \mu$ have (i) no solution (ii) a unique solution (iii) an infinite number of solutions.	7M
b)	Solve the equations: $x + y - 2z + 3w = 0$; $x - 2y + z - w = 0$; $4x + y - 5z + 8w = 0$; $5x - 7y + 2z - w = 0$.	7M
3.	Find the Eigen values and Eigen vectors of the matrix $A=\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$	14M
4.	Verify Cayley Hamilton theorem for the matrix $A=\begin{bmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{bmatrix}$. Hence compute A^4 and A^{-1}	14M
5. a)	Test for convergence of the series $\sum \left(\dfrac{n}{n+1}\right)^n x^n$, $x > 0$	7M
b)	Test for convergence of the series $\dfrac{1}{1.2.3} + \dfrac{3}{2.3.4} + \dfrac{5}{3.4.5} + \ldots\ldots\ldots$	7M

6. a)	Find the value of c using Lagrange's Mean Value Theorem for $f(x) = x^3 - x^2 - 5x + 3$ in $[0,4]$	7M
b)	Expand the function $f(x) = e^x$ about the point $x=1$ using taylor's series	7M
7.	A rectangular box open at the top is to have volume of 32 cubic ft. Find the dimensions of the box requiring least material for its construction.	14M
8. a)	If $u = x^2 - 2y, v = x + y + z, w = x - 2y + 3z$ find $\dfrac{\partial(u,v,w)}{\partial(x,y,z)}$	7M
b)	Show that the functions $u = xy + yz + zx, v = x^2 + y^2 + z^2$ and $w = x + y + z$ are functionally related. Find the relation among them.	7M

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