



B.Tech I Semester Supplementary Examinations, June 2024

MATHEMATICS-I
 (Common to CE,EEE,ME,ECE,CSE & IT)

Maximum Marks: 70

Date: 25.06.2024 Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks		(10X2M=20 Marks)	CO	Bloom Tx
1	Find the values of a and b, so that the rank of $\begin{bmatrix} 1 & -2 & 3 & -1 \\ 2 & 1 & -1 & 2 \\ 0 & -2 & a & b \end{bmatrix}$ is 3.		1	L1
2	Show that the matrix is A unitary where $A = \frac{1}{2} \begin{bmatrix} 1+i & -1+i \\ 1+i & 1-i \end{bmatrix}$		1	L1
3	Prove that the Eigen values of a real symmetric matrix are real.		2	L1
4	If '2' is an Eigen value of the matrix $A = \begin{bmatrix} 2 & -2 & 2 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$, find the other two Eigen values.		2	L1
5	State Raabe's test.		3	L1
6	Test the convergence of the series $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n+1}}$		3	L1
7	Verify $\frac{\partial^2 f}{\partial x \partial y} = \frac{\partial^2 f}{\partial y \partial x}$ for $f = ax^2 + 2hxy + by^2$		4	L1
8	If $u = e^x \sin y$; $v = e^x \cos y$ then find $\frac{\partial(u,v)}{\partial(x,y)}$		4	L1
9	Find the limits by change the order of integration $\int_0^a \int_{x/a}^{\sqrt{x/a}} (x^2 + y^2) dx dy$		5	L1
10	Evaluate $\int_0^1 \int_0^1 \int_0^1 e^{x+y+z} dx dy dz$		5	L1

Part-B

Answer All the following questions.		(5X10M=50Marks)		
11	Discuss for what values of λ , μ the system of equations $x + y + z = 6$, $x + 2y + 3z = 10$, $x + 2y + \lambda z = \mu$ have <div style="text-align: right;">[10M]</div> (i) no solution (ii) a unique solution (iii) an infinite number of solutions		1	L2

	OR		
12	Find the non singular matrices P and Q such that PAQ is the normal form, hence find the rank of the matrix when. [10M] $A = \begin{bmatrix} 1 & 2 & 1 & 0 \\ -2 & 4 & 3 & 0 \\ 1 & 0 & 2 & -8 \end{bmatrix}$	1	L2
13	Verify Cayley-Hamilton theorem and hence find A^4 of the matrix. [10M] $A = \begin{bmatrix} 7 & 2 & -2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{bmatrix}$	2	L2
	OR		
14	Reduce the following quadratic form to canonical form $Q = 2x_1x_2 + 2x_2x_3 + 2x_3x_1$ by an orthogonal transformation [10M]	2	L2
15	Show that the series $1 + \frac{1}{2^2} + \frac{2^2}{3^3} + \frac{3^3}{4^3} + \dots$ is divergent. [10M]	3	L2
	OR		
16	Discuss the nature of the series $\sum \frac{3.6.9\dots 3n}{4.7.10\dots(3n+1)} \cdot \frac{5^n}{(3n+2)}$ [10M]	3	L2
17	Find the minimum value of $x^2 + y^2 + z^2$ with the constraint $xy + yz + zx = 3a^2$ using Lagrange's method of multipliers. [10M]	4	L2
	OR		
18	A rectangular box open at the top is to have a volume of 32 cubic units, find the dimensions of the box requiring least material for its construction. [10M]	4	L2
19	Change the order of integration and evaluate [10M] $\int_0^a \int_x^a (x^2 + y^2) dy dx$	5	L2
	OR		
20	Evaluate $\int \int \int z^2 dx dy dz$ taken over the volume bounded by $x^2 + y^2 = a^2$, $x^2 + y^2 = z$ and $z = 0$. [10M]	5	L2