Code: 558

NOV-DEC 2023 EXAMINATION
I B.E /B. TECH EXAM
MA 10501:-MATHEMATICS-II

Time: 3 Hrs.] [Max. Marks: 70

TOTAL NO. OF QUESTIONS IN THIS PAPER:5

Note: Attempt all questions. All questions carry equal marks. Each question carries five subparts a, b, c, d and e. Parts a, b and c are compulsory and attempt any one from d and e.

S. No.		Questions	Mark	CO	BL	PI
Q.1	(a)	Find the Eigen values of the matrix $\begin{bmatrix} 1 & -2 \\ -5 & 4 \end{bmatrix}$	(02)	1	1,2	1.1.1
	(b)	Prove that $A = \begin{bmatrix} 4 & 1-3i \\ 1+3i & 7 \end{bmatrix}$ is Hermitian matrix	(02)	1	1,2	1.1.1
	(c)	Show that the vectors x = (2, 3, 1, -1), y = (2, 3, 1, -2), z = (4, 6, 2, 1) are linearly dependent. Express one of the vectors as linear combination of the others.	(03)	1	2	1.1.1
	(d)	Find Non-Singular matrices P and Q such that PAQ is normal form, Hence find the Rank of A where $A = \begin{bmatrix} 2 & -2 & 3 \\ 3 & -1 & 2 \\ 1 & 2 & -1 \end{bmatrix}$	(07)	1	3	1.1.1
		OR				
	(e)	(i) State Cayley Hamilton theorem. (ii) Investigate the values of λ *and* μ so that the equations $2x+3y+5z=9, 7x+3y-2z=8,\ 2x+3y+\lambda z=\mu$ have (i) No solution (ii) a Unique solution (iii) an infinite number of solution.	(07)	1	1,4	1.1.1
Q.2	(a)	Write Order and Degree of the following equation $$x^2\left(\frac{d^2y}{dx^2}\right)^2 + y\left(\frac{dy}{dx}\right)^4 + y^4 = 0$$	(02)	2	1	1.1.1
	(b)	Form the differential equation by Eliminating arbitrary constant. $$y^2 = Ax^2 + Bx + C$$	(02)	2	1,2	1.1.1
	(c)	Solve the differential equation $(x^2 - yx^2)dy + (y^2 + xy^2)dx = 0$	(03)	2	2	1.1.1
	(d)	Solve $\frac{dy}{dx} + \frac{1}{x}\tan y = \frac{1}{x^2}\tan y \sin y$	(07)	2	1,3	1.1.1
		OR				
	(e)	Solve $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = e^{2x} + x^3 + \cos 2x$	(07)	2	1,3	1.1.1
Q.3	(a)	Find the Complimentary Function of $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0.$	(02)	3	1	1.1.1
	(b)	Solve the following differential equation $\frac{dx}{dt} = y + 1, \frac{dy}{dt} = x + 1$	(02)	3	2	1.1.1

	(c)	Form a differential equation of an R-C circuit having voltage across resistor (R) and capacitor(C) are given by $V_i = R_i$ and $V_c = \frac{1}{C}\int i dt$ *respectively* (where i denotes the current).	(03)	3	1,2	1.1.1
	(d)	Solve $(3x+2)^2\frac{d^2y}{dx^2} + 3(3x+2)\frac{dy}{dx} - 36y = 3x^2 + 4x + 1$.	(07)	3	3	1.1.1
		OR				
	(e)	Apply the method of variation of parameter to solve $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = \frac{e^x}{1+e^x}$	(07)	3	1,2	1.1.1
Q.4	(a)	Write any three properties of Normal curve.	(02)	4	1	1.1.1
	(b)	Students of a class were given an aptitude test. Their marks were found to be normally distributed with mean 60 and standard deviation 5. What percentage of students scored more than 60 marks?	(02)	4	1	1.1.1
	(c)	Assume that the probability of an individual coal miner being killed in a mine accident during a year is $\frac{1}{2400}$. Use appropriate statistical distribution to calculate the probability that in a mine employing 200 miners, there will be at least one fatal accident in a year. ($e^{-\frac{1}{12}} = 0.92$)	(03)	4	2	1.1.1
	(d)	Derive the formula of mean and variance of binomial distribution.	(07)	4	3	1.1.1
		OR				
	(e)	(i) Write down the recurrence formula of Poisson distribution. (ii) By the method of least square, find the straight line that best fits the following data. x: 1, 2, 3, 4, 5 y: 14, 27, 40, 55, 68	(07)	4	3	1.1.1
Q.5	(a)	Express $\frac{(3+4i)(2+i)}{(1+i)}$ in the form of $a + ib$.	(02)	5	2	1.1.1
	(b)	Find the complex conjugate of $\frac{2+3i}{1-i}$.	(02)	5	2	1.1.1
	(c)	Expand $tan5\theta$ in powers of $tan\theta$ using D-Moivre's theorem.	(03)	5	3	1.1.1
	(d)	If $\alpha, \alpha^2, \alpha^3, \alpha^4$, are the roots of $x^5 - 1 = 0$ find them and show that $(1-\alpha)(1-\alpha^2)(1-\alpha^3)(1-\alpha^4) = 5$.	(07)	5	3	1.1.1
		OR				
	(e)	(i) Separate $\sin(x+iy)$ into real and imaginary parts. (ii) Sum the series $Sin\alpha - \frac{Sin(\alpha+2\beta)}{2!} + \frac{Sin(\alpha+4\beta)}{4!} - \cdots\infty$	(07)	5	3	1.1.1

x	1	2	3	4	5
y	14	27	40	55	68