Code: 1208

NOV-DEC 2024 EXAMINATION
I B.E /B. TECH EXAM
MA 10511:-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)	Define Hermitian and Skew Hermitian Matrix.	(02)	1	1	1.1.1
	(b)	Examine for linear dependence or independence of vectors: $x_1 = (1,2,3), x_2 = (2,-2,6)$ If dependent, find the relation between them.	(02)	1	1,2	1.1.1
	(c)	Find the Eigen values and Eigen vector of matrix $A = \frac{1}{24}\begin{bmatrix} 2 & 4 \\ -2 & 8 \end{bmatrix}$	(03)	1	1,2	1.1.1
	(d)	Reduce the following matrix into its normal form and hence find its Rank. $$A = \begin{bmatrix} 2 & 1 & -3 & -6 \\ 3 & -3 & 1 & 2 \\ 1 & 1 & 1 & 2 \end{bmatrix}$$	(07)	1	3	1.1.1
		OR				
	(e)	Determine the values of λ and μ such that the system $$2x - 5y + 2z = 8, 2x + 4y + 6z = 5, x + 2y + \lambda z = \mu$$ have (i) no solution (ii) a unique solution (iii) infinite number of solutions.	(07)	1	4	1.1.2
Q.2	(a)	Define Diagonalization of Matrix.	(02)	2	1	1.1.1
	(b)	If $A = \begin{bmatrix} 2 & 4 \\ -3 & 2 \end{bmatrix}$, find A^{-1}.	(02)	2	1,2	1.1.1
	(c)	Verify Cayley Hamilton theorem for the matrix $A = \begin{bmatrix} 3 & -1 \\ -1 & 5 \end{bmatrix}$	(03)	2	2	1.1.1
	(d)	Let $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$. Find matrix P such that $P^{-1}AP$ is diagonal matrix .	(07)	2	1,3	1.1.1
		OR				
	(e)	Reduce the following quadratic form to canonical form by orthogonal transformation. Also, find the rank, index, signature, and value class (nature) of the quadratic form. $$x_1^2 + 2x_2^2 + 3x_3^2 + 2x_1x_2 - 2x_1x_3 + 2x_2x_3$$	(07)	2	1,3	1.1.2

Q.3	(a)	Obtain the differential equation associated with the primitive $y = A\cos x + B\sin x$	(02)	3	1	1.1.1
	(b)	Solve by exactness $(5x^4 + 3x^2y^2 - 2xy^3)dx + (2x^3y - 3x^2y^2 - 5y^4)\,dy = 0$	(02)	3	2	1.1.1
	(c)	Solve $(x^2 - y.x^2)dy + (y^2 + xy^2)dx = 0$	(03)	3	1,2	1.1.1
	(d)	Solve $\frac{dy}{dx} = 2y\tan x + y^2\tan^2 x$	(07)	3	3	1.1.1
		OR				
	(e)	Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 3y = e^{2x} + \cos x + x^2$	(07)	3	1,2	1.1.2
Q.4	(a)	Write down the basic steps for solving Legendre's homogeneous linear differential equation.	(02)	4	1	1.1.1
	(b)	Solve the simultaneous equation $\frac{dx}{dt} + 10y = 0, \frac{dy}{dt} - 10x = 0.$	(02)	4	1	1.1.1
	(c)	Find the Complimentary function of $x^2\frac{d^2y}{dx^2} + 2x\frac{dy}{dx} - 12y = 0$	(03)	4	2	1.1.1
	(d)	The equation of electromotive force in terms of current i for an electrical circuit having resistance R and a condenser of capacity C, in series is $E = Ri + \int \frac{i}{C}dt$. Find the current $i$at any time t, when $E = E_0 \sin wt$.	(07)	4	3	1.1.2
		OR				
	(e)	Apply the method of variation of parameters $\frac{d^2y}{dx^2} + y = (x - \cot x)$	(07)	4	3	1.1.1
Q.5	(a)	An urn contains 10 black and 10 white balls. Find the probability of drawing two balls of the same colour.	(02)	5	2	1.1.1
	(b)	A die is tossed. If the number is odd, what is the probability that it is prime?	(02)	5	2	1.1.1
	(c)	In a normal distribution, 31 % of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution. [Given that $Z(0.19) = 0.496, Z(0.42) = 1.405$]	(03)	5	3	1.1.1
	(d)	A can hit a target 3 times in 5 shots, B 2 times in 5 shots and C three times in 4 shots. All of them fire one shot each simultaneously at the target. What is the probability that (i) 2 shots hit (ii) At least two shots hit?	(07)	5	3	1.1.1
		OR				
	(e)	(i) Derive the formula of Mean of Binomial Distribution. (ii) If the mean and variance of a binomial distribution are 4 and 2 respectively, find the probability of (i) exactly 2 successes (ii) less than 2 successes (iii) at least 2 successes.	(03+ 04)	5	2,3	1.1.2

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