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Reg No.:_______________ Name:_______________________

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

First Semester B.Tech Degree Regular Examination December 2024 (2024 Scheme)

Course Code: GYMAT101

Course Name: MATHEMATICS FOR ELECTRICAL SCIENCE – 1 / PHYSICAL SCIENCE - 1

Max. Marks: 60 Duration: 2 hours 30 minutes

PART A

	(Answer all questions. Each question carries 3 marks)	CO	Marks
1	Find the rank of the matrix $\begin{bmatrix} 2 & 1 & -1 \\ 0 & 3 & -2 \\ 2 & 4 & -3 \end{bmatrix}$	CO 1	(3)
2	Find the eigen values and eigen vectors of $\begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix}$	CO 1	(3)
3	Show that $y_1 = e^{-2x}, y_2 = e^{3x}$ are linearly independent	CO 2	(3)
4	Solve: $y'' + 3y = 0$	CO 2	(3)
5	Find $L[e^{2t} + 4t^3 - 2\sin 3t]$	CO 3	(3)
6	Find $L^{-1}\left[\frac{s^2-3s+4}{s^3}\right]$	CO 3	(3)
7	If $f(x)$ is a periodic function with period 2π in the interval $-\pi < x < \pi$, write the Euler's formula to find a_0, a_n and b_n .	CO 4	(3)
8	Expand $f(x) = e^x$ as a Maclaurin's series	CO 4	(3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

Module -1

9		Find the value of μ for which the system of equations $x + y + z = 1, x + 2y + 3z = \mu, x + 5y + 9z = \mu^2$ is consistent. For each value of μ obtained, find the solutions of the system.	CO 1	(9)
10		Diagonalize: $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 3 & 2 \\ 0 & 0 & 2 \end{bmatrix}$	CO1	(9)

Module -2

11		Solve using the method of variation of parameters: $y'' - y = x^2$	CO 2	(9)
12	a)	Solve the initial value problem: $y'' + 4y = 0, y(0) = 4, y'(0) = 2$.	CO 2	(5)
	b)	Using the method of undetermined coefficients, solve $y'' + 3y' + 2y = 12x^2$.	CO 2	(4)

Module -3

13	a)	Use Laplace transforms, solve $y'' + 5y' + 6y = 0, y(0) = 0, y'(0) = -1$.	CO3	(5)
	b)	Find $L^{-1}\left[\frac{2s+1}{s^2+2s+5}\right]$	CO3	(4)
14	a)	Using Convolution theorem, find $L^{-1}\left[\frac{1}{s(s^2+4)}\right]$	CO3	(5)
	b)	Find $L[f(t)]$, where $f(t) = \begin{cases} t-1, 1 < t < 2 \\ 3-t, 2 < t < 3 \end{cases}$	CO3	(4)

Module -4

15 Find the Fourier series expansion of $f(x) = x^2 - 2$ in the interval $-2 < x < 2$. CO4 (9)

16 Obtain the Half-range Fourier cosine series of $f(x) = x in (0, \pi)$. CO4 (9)

Hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots = \frac{\pi^2}{8}$

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