22PHU206N

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2025
(Second Semester)

Branch - **PHYSICS**

MATHEMATICS – II FOR PHYSICS

Time: Three Hours Maximum: 75 Marks

SECTION-A (10 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	Two matrices A and B are said to be similar if there exists a non-singular matrix P such that ….. a) $P^{-1}AP = A$ b) $P^{-1}A = B$ c) $P^{-1}AP = B$ d) $P^{-1}BP = B$	K1	CO1
	2	By Cayley-Hamilton theorem, every matrix satisfies its own ……. a) equation b)eigen values c)characteristic equation d)eigen vectors	K2	CO1
2	3	Elimination of a and b from $z = f(x^2 + y^2)$ gives _____. a) $px = qy$ b) $p = qx$ c) $py = q$ d) $py = qx$	K1	CO2
	4	The differential equation of all spheres whose centres lie on the z-axis is _____. a) $xp = yq$ b) $yp = xq$ c) $xp = y$ d) $x = yq$	K2	CO2
3	5	$L(e^{-3t}) =$ _____. a) $\frac{1}{s-3}$ b) $\frac{1}{s+3}$ c) $\frac{s}{s+3}$ d) $\frac{1}{s+2}$	K1	CO3
	6	$L^{-1}\left[\frac{s}{(s+2)^2}\right]$ _____. a) $e^{-2t}(1+2t)$ b) $e^{-2t}(1-2t)$ c) $e^{t}(1-2t)$ d) $e^{2t}(1+2t)$	K2	CO3
4	7	Which of the following is an even function? a) $\cos t$ b) t c) t^5 d) $\sin t$	K1	CO4
	8	For given $f(x) = x^2$, $a_0 =$ _____. a) $\frac{\pi^2}{3}$ b) $\frac{2\pi}{3}$ c) $\frac{2\pi^2}{4}$ d) $\frac{2\pi^2}{3}$	K2	CO4
5	9	$F\{e^{iax} f(x)\} =$ _____. a) $F(s)$ b) $F(s-a)$ c) $F(t-a)$ d) $F(s+a)$	K1	CO5
	10	$F_S\{f(ax)\} =$ _____. a) $\frac{1}{a}F_S\left(\frac{s}{a}\right)$ b) $\frac{1}{a}F_S(s)$ c) $F_S\left(\frac{s}{a}\right)$ d) $\frac{1}{a}F_C\left(\frac{s}{a}\right)$	K2	CO5

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SECTION - B (35 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Find the characteristic equation of the matrix $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$.	K2	CO1
		(OR)		
	11.b.	If $\lambda_1, \lambda_2 ... \lambda_n$ are the eigen values of the matrix A, then prove that the matrix KA has the eigen values $K\lambda_1, K\lambda_2 ... K\lambda_n$.		
2	12.a.	Solve : $(mz - ny)p + (nx - lz)q = ly - nx$.	K3	CO2
		(OR)		
	12.b.	Solve $(y^2 + z^2)p - xyq = -xz$.		
3	13.a.	Find $L(te^{-t} \sin t)$.	K3	CO3
		(OR)		
	13.b.	Find $L^{-1}\left[\frac{1}{s(s+1)(s+2)}\right]$.		
4	14.a.	If $f(x)$ is an odd function, then prove that $\int_{-a}^{+a} f(x)dx = 0$.	K4	CO4
		(OR)		
	14.b.	Find a cosine series in the range 0 *to* π for $f(x) = x \quad , \left(0 < x < \frac{\pi}{2}\right)$ $= \pi - x, \left(\frac{\pi}{2} < x < \pi\right)$		
5	15.a.	Prove that $F\{x^n f(x)\} = (-i)^n \frac{d^n}{ds^n} F\{f(x)\}$.	K4	CO5
		(OR)		
	15.b.	Show that $F_C\left\{\frac{1}{\sqrt{x}}\right\} = \frac{1}{\sqrt{s}}$.		

SECTION -C (30 Marks)

Answer **ANY THREE** questions

ALL questions carry **EQUAL** Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Evaluate the matrix $A^6 - 25A^2 + 122A$ where A is $\begin{bmatrix} 0 & 0 & 2 \\ 2 & 1 & 0 \\ -1 & -1 & 3 \end{bmatrix}$	K4	CO1
2	17	Solve $z = px + qy + \sqrt{(1 + p^2 + q^2)}$.	K5	CO2
3	18	Solve the equation $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} - 3y = \sin t$ given that $y = \frac{dy}{dt} = 0$ when $t = 0$.	K6	CO3
4	19	If $f(x) = -x, -\pi < x < 0$ $= x \quad , 0 \le x < \pi$, expand $f(x)$ as Fourier series in the interval $-\pi$ *to* π. Deduce that $\frac{\pi^2}{8} = 1 + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} + ...$	K4	CO4
5	20	Find $F_C\left\{\frac{1}{1+x^2}\right\}$ *and* $F_S\left\{\frac{x}{1+x^2}\right\}$.	K5	CO5

Z-Z-Z END