

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
BSc DEGREE EXAMINATION) MAY 2024
(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	The eigen values of $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ are a) 1,1 b) 1,0 c) 1,2 d) 0,0	K1	CO1
	2	Which of the following is a diagonal matrix? a) $\begin{pmatrix} 1 & 0 \\ 3 & 2 \end{pmatrix}$ b) $\begin{pmatrix} 1 & 0 \\ 0 & 2 \end{pmatrix}$ c) $\begin{pmatrix} 1 & 4 \\ 5 & 6 \end{pmatrix}$ d) $\begin{pmatrix} 0 & 4 \\ 5 & 0 \end{pmatrix}$	K1	CO1
2	3	Elimination of a and b from $z = (x+a)(y+b)$ gives a) $z = p$ b) $z = q$ c) $z = pq$ d) $z^2 = pq$	K2	CO2
	4	A solution of $x + y \frac{\partial z}{\partial x} = 0$ is a) $z = \frac{x}{2y} + \varphi(y)$ b) $z = \frac{-x^2}{y} + \varphi(y)$ c) $z = \frac{-x^2}{2y} + \varphi(y)$ d) $z = \frac{-x^2}{2y} + \varphi(x)$	K2	CO2
3	5	$L\{\cosh at\} =$ a) $\frac{s}{s^2 - a^2}$ b) $\frac{a}{s^2 - a^2}$ c) $\frac{s}{s^2 + a^2}$ d) $\frac{1}{s^2 - a^2}$	K1	CO3
	6	$L^{-1}\left\{\frac{1}{(s+2)^2 + 16}\right\} =$ a) $\frac{e^{-2t} \sin t}{4}$ b) $\frac{e^{-t} \sin 4t}{4}$ c) $\frac{e^{2t} \sin 4t}{4}$ d) $\frac{e^{-2t} \sin 4t}{4}$	K2	CO3
4	7	Which of the following is an odd function? a) x^2 b) x^8 c) $\cos x$ d) $\sin x$	K1	CO4
	8	For given $f(x) = \frac{1}{2}(\pi - x)$, $a_0 =$ a) 1 b) 0 c) -1 d) 4	K2	CO4
5	9	$F_c(f(ax)) =$ a) $F_c\left(\frac{s}{a}\right)$ b) $\frac{1}{a}F_c\left(\frac{a}{s}\right)$ c) $\frac{1}{a}F_c\left(\frac{s}{a}\right)$ d) $\frac{1}{s}F_c\left(\frac{s}{a}\right)$	K1	CO5
	10	$\overline{F(s)} =$ a) $F\{\overline{f(x)}\}$ b) $F\{\overline{f(-x)}\}$ c) $F\{f(-x)\}$ d) $F\{f(x)\}$	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.	If the matrix B is similar to the matrix A , then prove that A and B have the same characteristic equation.	K3	CO1
		(OR)		
	11.b.	Find the eigen values of $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$.		
2	12.a.	Eliminate the arbitrary functions f and φ from the relation $z = f(x + ay) + \varphi(x - ay)$.	K3	CO2
		(OR)		
	12.b.	Solve $p^2 + q^2 = npq$.		
3	13.a.	Find $L^{-1} \left\{ \log \frac{s+1}{s-1} \right\}$.	K3	CO3
		(OR)		
	13.b.	Find $L(\sin^3 2t)$.		
4	14.a.	Express $f(x) = x$ ($-\pi < x < \pi$) as a Fourier series with period 2π .	K4	CO4
		(OR)		
	14.b.	Find a sine series for $f(x) = c$ in the range 0 to π .		
5	15.a.	Prove that $F \left\{ \frac{d^n}{dx^n} f(x) \right\} = (-is)^n F(s)$.	K4	CO5
		(OR)		
	15.b.	Find $F_C \{e^{-ax}\}$ and $F_S \{e^{-ax}\}$.		

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	Diagonalise the matrix $\begin{bmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{bmatrix}$.	K3	CO1
2	17	Solve $(x^2 - yz)p + (p^2 - zx)q = z^2 - xy$.	K3	CO2
3	18	Show that the solution of the differential equation $\frac{d^2 y}{dt^2} + 4y = A \sin kt$ which is such that $y = 0$ and $\frac{dy}{dt} = 0$ when $t = 0$ is $y = A \frac{\sin kt - \frac{k}{2} \sin kt}{4 - k^2}$ if $k \neq 2$. If $k = 2$, show that $y = \frac{A(\sin 2t - 2t \cos 2t)}{8}$.	K4	CO3
4	19	Show that $x^2 = \frac{\pi^2}{3} + 4 \sum_{n=1}^{\infty} (-1)^n \frac{\cos nx}{n^2}$, ($-\pi \leq x \leq \pi$).	K4	CO4
5	20	Prove that $F\{f(ax)\} = \frac{1}{ a } F\left(\frac{s}{a}\right)$.	K4	CO5

Z-Z-Z

END