BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH/IMSC
BRANCH: ALL/PHYSICS

SEMESTER : II
SESSION : SP/2024

SUBJECT: MA107- MATHEMATICS-II

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Find a particular integral of the second order non-homogeneous differential equation $y'' + y = 3x + 7\tan x$	[5]	CO1	1.10
Q.1(b)	Solve by variation of Parameter $\frac{d^2y}{dx^2} + 9y = tan3x.$	[5]	1	3
Q.2(a)	Find a series solution near x=0 for $3x^2y'' - xy' + y = 0$	[5]	CO2	1.12
Q.2(b)	Express $f(x) = x^4 + 2x^3 + 2x^2 - x$ in terms of legendre polynomials. Given $P_n(x) = \frac{1}{n!2^n}\frac{d^n}{dx^n}(x^2-1)^n$	[5]	CO2	1.21 1.24
Q.3(a)	Find the Fourier cosine series of the function $f(x) = \begin{cases} x^2 & , 0 \le x \le 2 \\ 4 & , 2 \le x \le 4 \end{cases}$	[5]	3	2
Q.3(b)	Find the solution of the given wave equation by the separation of variable method: $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}, 0 < x < \pi, t > 0$ u (0, t) = u (π, t) =0 u (x, 0) = 0, $\frac{\partial u}{\partial x}(x,0) = sinx.$	[5]	CO3	1.31
Q.4(a)	Find the value of the integral $\oint_{\lvert z\rvert=3} \frac{e^z}{(z-2)^3} dz$	[5]	CO4	1.25
Q.4(b)	Evaluate $\oint_C \frac{1}{z^2+4} dz$, where C is the contour C: $\lvert z - i\rvert = 2$.	[5]	CO4	1.31
Q.5(a)	A random Variable x has the following probability distribution	[5]	CO3	2

Values of x	-2	-1	0	1	2	3
Probability P(x)	0.1	k	0.2	2k	0.3	k

Find the value of k, $E(x)$ and $\sigma^2(x)$.

Q.5(b)	On average, every one out of 10 telephones is found busy. Six telephone numbers are selected at random. I. Find the probability that four of them will be busy. II. Find the probability that at least two of them will be busy.	[5]	CO5	1.32

:::::23/04/2024 E:::::