END - SEMESTER

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

CLASS: BTECH/IMSC
BRANCH: ALL/FOOD TECHNOLOGY

SEMESTER : II
SESSION : SP/2022

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. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a) Can $Sin(\ln x^2)$, $Cos(\ln x^2)$ (where $x > 0$) be two linearly independent solutions of an ordinary differential equation? If so, determine the equation. [5]

Q.1(b) Find the general solution of the differential equation $y'' - 4y' + 13y = 18e^{x} Sin3x$ [5]

Q.2(a) Prove the recurrence relation $xJ_n'(x) = xJ_{n-1}(x) - nJ_n(x)$ [5]

Q.2(b) Find the series solution of the differential equation $2x^2y'' - xy' + (x-5)y = 0$ about $x = 0$. [5]

Q.3(a) Find Fourier series expansion of the function $f(x) = |x|, \quad -\pi < x < \pi$ and hence prove that [5]
$\frac{\pi^2}{8} = 1 + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} + \ldots$

Q.3(b) Solve $pCos(x+y) + qSin(x+y) = z$ [5]

Q.4(a) Show that the function $f(z) = |z|^2$ is differentiable at $z = 0$ but nowhere analytic. [5]

Q.4(b) Evaluate $\oint_C \frac{e^z}{(z-1)Sinz} dz$; Where C is the positively oriented circle $|z| = 2$ [5]

Q.5(a) Let X has pdf $f_X(x) = \begin{cases} cx^3; & 0 < x < 2 \\ 0; & elsewhere \end{cases}$ Find the value of c and $P[\frac{1}{4} < X < 1]$. [5]

Q.5(b) Let X be a random variable having binomial distribution with parameter $n = 25; \quad p = 0.2$. Find $P[X < \mu_x - 2\sigma_x]$ [5]

:::::18/07/2022:::::