JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

T-3, EXAMINATION- 2023

B. Tech. II Semester (BI/BT)

COURSE CODE (CREDITS): 18B11MA212 (04)　　　　MAX. MARKS: 35

COURSE NAME: BASIC MATHEMATICS-II

COURSE INSTRUCTORS: MDS　　　　　　　MAX. TIME: 120 Minutes.

Note: Note: (a) All questions are compulsory.
(b)Marks are indicated against each question in square brackets.
(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems
(d) Scientific calculator is allowed

Quest.(1) Examine the convergence of the series　　　　　　　　　(CO-1) [3]

$$\sum_{n=1}^{\infty} \frac{n^{3/2}}{\sqrt{(n^4 + 5)}} x^n$$

Quest.(2) Expand $f(x, y) = 5x^2 - 3xy + 2y^2 + x - 2y + 9$ in Taylor's series of maximum order about the point $(-1, 1)$.　　　　　　　(CO-2) [3]

Quest.(3) Test whether the equation $(4x + 3y + 1)dx + (3x + 2y + 1)dy = 0$, is exact and hence solve it.　　　　　　　　　(CO-3) [3]

Quest. (4) (a) Find the complementary function (C.F.) of　　　(CO-4) [3+3]
$$(D - 2)^2(D^2 - 2D + 6)y = e^x \cos x.$$

(b) Find the particular integral (P.I.) of
$$\left(x^2 \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} + 4y\right) = 2x^2$$

Quest.(5) Calculate the standard deviation for the following data which represents the wages of 230 workers.　　　　　　　　　(CO-5) [5]

Wages (in Rupees)	70 - 80	80 - 90	90 - 100	100 - 110	110 -120	120 - 130	130 - 140	140 - 150
No. of workers	12	18	35	42	50	45	20	8

Quest.(6) Find the median for the following frequency distribution.　　(CO-5) [4]

Age (in years)	10.5 – 15.5	15.5 – 20.5	20.5 – 25.5	25.5 – 30.5	30.5 – 35.5	35.5 – 40.5
No. of members	3	5	6	9	10	7

Quest.(7) The population of a town in the decennial census was given below. Estimate the population for year 1695, by using Newton's forward difference interpolation formula. **(CO-5) [5]**

Year (x)	1691	1701	1711	1721	1731
Population (y) (in thousand)	41	60	78	91	100

Quest.(8) (a) Perform three iterations of the *Newton-Raphson method* to determine a root of the equation

$$x^3 - 4x - 9 = 0.$$

Take the intial approximation $x_0 = 2.625$.

(b) Evaluate $\int_0^2 4\, e^{x^2}\, dx$, using Simpson's 1/3 rule with $h = 0.2$. **(CO-6) [3+3]**