JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2024

B.Tech-II Semester (BT/BI)

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

COURSE NAME: BASIC MATHEMATICS-II

COURSE INSTRUCTORS: MDS MAX. TIME: 2 Hours

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.

Q1. Explain the *Alternating series test* and examine the following series for conditionally or absolutely convergence **[3] (CO-1)**

$$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{2n(n+2)(n+5)}.$$

Q2. (a) Show that $f(x,t) = e^{x-at}$ satisfy the wave equation $\frac{\partial^2 f}{\partial t^2} = a^2 \frac{\partial^2 f}{\partial x^2}$. **[2+2] (CO-2)**

(b) Find the directional derivative of $\phi(x,y,z) = x^2yz + 4x\,z^2$, at $(1,-2,1)$ in the direction of $\vec{b} = 2\hat{i} - \hat{j} - 2\hat{k}$.

Q3. Expand $f(x,y) = e^x \cos y$ about the point $\left(0, \frac{\pi}{2}\right)$ up to second degree terms using Taylor's series. **[3] (CO-2)**

Q4. Solve the Bernoulli's equation $\frac{dy}{dx} + \frac{1}{9}y = e^x y^7$ **[3] (CO-3)**

Q5. Solve the following linear differential equations with constant coefficients **[4] (CO-4)**

$$(D^2 - 2D - 3)y = 7e^{-x} - 12 \sin x.$$

Q6. Fifty baby carrots were grown using special soil. Someone dug them up, measured their lengths (to the nearest mm), and grouped the data as follows: **[2.5+2.5] (CO-5)**

Length (mm)	150-155	155-160	160-165	165-170	170-175	175-180	180-185	185-190
Frequency	5	2	6	8	9	11	6	3

Find the estimated (a) Median (b) Mode

Q7. Calculate the standard deviation for the following data **[5] (CO-5)**

Life time (months)	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-110	110-120
No. of Mobile	4	6	8	26	28	12	8	5	3

Q8. Evaluate the following integral, $\int_0^1 (4x - 3x^2)\,dx$, using **[5] (CO-6)**

(i) Simpson's one-third rule

(ii) Trapezoidal rule,

with number of subintervals n =10

Q9. Using Lagrange Interpolation, find the value of y at $x = 3$, for the following data **[3] (CO-6)**

x	0	1	7
$y = f(x)$	18	42	57