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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -3EXAMINATIONS- 2026
B.Tech. -II Semester (BI/BT)

COURSE CODE (CREDITS): 25B11MA212

MAX MARKS: 35

COURSE NAME: MATHEMATICS FOR LIFE SCIENCES-II

COURSE INSTRUCTOR: MDS

MAX. TIME: 2 Hours

Note: (a) All questions are compulsory.

(b) The candidate is allowed to make suitable numeric assumptions wherever required for solving problems.

(c) Scientific calculator is allowed.

Q.No	Question	CO	Marks																										
Q1	Test the convergence of the following $\frac{x}{\sqrt{5}} + \frac{x^3}{\sqrt{7}} + \frac{x^5}{\sqrt{9}} + \frac{x^7}{\sqrt{11}} + \dots, x > 0$	CO-1	3																										
Q2	(a) For $z = \frac{x^{\frac{1}{2}} + y^{\frac{1}{2}}}{x^{\frac{1}{3}} + y^{\frac{1}{3}}}$ i. Check whether z is homogeneous or not, if yes find its degree also? ii. If $u = \sin^{-1}(z)$, then find the value of $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$. (b) Find the extreme values of the function $f(x, y) = 50x + 40y - x^2 - y^2 - xy$.	CO-2	3+3																										
Q3	(a) Find the general solution of the equation $\frac{d^2y}{dx^2} - \frac{dy}{dx} + 2y = e^{2x} + \cos x + \tan 2$ (b) Find Laplace transform of $f(t) = t e^{3t} \sinh 2t$ (c) Find the inverse Laplace transformation of $L^{-1} \left[\frac{s + 8}{s^2 + 4s + 5} \right]$	CO-3	3+3+3																										
Q4	(a) The following data represents marks of students: <table><tr><td>Marks</td><td>0-10</td><td>10-20</td><td>20-30</td><td>30-40</td><td>40-50</td></tr><tr><td>Frequency</td><td>5</td><td>9</td><td>14</td><td>20</td><td>12</td></tr></table> Find (a) Median (c) Mode. (b) The following table shows marks of 100 students: <table><tr><td>Marks</td><td>0-10</td><td>10-20</td><td>20-30</td><td>30-40</td><td>40-50</td><td>50-60</td></tr><tr><td>Frequency</td><td>6</td><td>14</td><td>20</td><td>30</td><td>18</td><td>12</td></tr></table> Find: (a) Mean (b) Standard Deviation	Marks	0-10	10-20	20-30	30-40	40-50	Frequency	5	9	14	20	12	Marks	0-10	10-20	20-30	30-40	40-50	50-60	Frequency	6	14	20	30	18	12	CO-5	4+4
Marks	0-10	10-20	20-30	30-40	40-50																								
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Frequency	6	14	20	30	18	12																							

Q5

(a) A car's fuel consumption rate (in liters/hour) is recorded at equal time intervals during a journey:

Time (hours)	0	1	2	3	4
Rate (L/hr)	3	3.5	4	4.5	5

Using Simpson's Rule, estimate the total fuel consumed over 4 hours.

(b) The concentration of a drug (mg/L) in blood is measured:

Time (hr)	1	2	3	4	5	6
Conc.	10	18	32	60	110	190

Estimate the drug concentration at 1.5 hours using Newton's Forward Interpolation

(c) A population is modeled by the function

$$P(t) = 100e^{0.3t} - 200$$

Using the Newton-Raphson Method, find the value of t at which the population becomes zero. Take the initial approximation as $t_0 = 1$, and perform four iterations.

CO-4

3+3+3