JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATIONS-2025

B.Tech-II Semester (CSE/IT/ECE/CE)

COURSE CODE (CREDITS):24B11MA211(04) MAX. MARKS: 35

COURSE NAME: Engineering Mathematics II

COURSE INSTRUCTORS: NKT, RAD, BKP, 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

Q.No	Question	CO	Marks
Q1	Test the convergence of the series $\left(\frac{1}{3}\right)^2 + \left(\frac{1}{3}\cdot\frac{2}{5}\right)^2 + \left(\frac{1}{3}\cdot\frac{2}{5}\cdot\frac{3}{7}\right)^2 + \ldots\ldots$	1	5
Q2	If $f(x) = x \quad , 0 < x < \frac{\pi}{2}$ $= \pi - x , \frac{\pi}{2} < x < \pi$ Find the half range Fourier sine series in the interval $(0, \pi)$.	1	5
Q3	Prove the following recurrence relation for the Legendre polynomial $P_n(x)$: $$(n+1)P_{n+1}(x) = (2n+1)xP_n(x) - nP_{n-1}(x)$$	2	5
Q4	Find the value of the Bessel function $J_{\frac{5}{2}}(x)$ in terms of sine and cosine.	2	3
Q5	Find the general solution of heat equation $\frac{\partial u}{\partial t} = 4\,\frac{\partial^2 u}{\partial x^2}$	3	5
Q6	Consider the following complex function: $$f(z) = \begin{cases} \bar{z}^2/z & , \quad z = 0 \\ 0 & , \quad z = 0 \end{cases}$$ Show that the Cauchy-Riemann equations are satisfied at z = 0 but that $f(z)$ is not differentiable there.	4	4
Q7	Answer the following questions with suitable diagrams of the contour C: (a) Evaluate $\oint_C \frac{\sin z}{(z^2-25)(z^2+9)}\,dz$, where C: $\lvert z\rvert = 1$. (b) Use Cauchy Integral Formula to evaluate: $$\oint_C \frac{3z^2 + z}{(z^2-1)}\,dz$$ where C is the circle $\lvert z - 1\rvert = 1$.	5	4

Q8	Using *Residue theorem*, evaluate $$\frac{1}{2\pi i}\oint_C \frac{e^{zt}}{z^2(z^2+2z+2)}\,dz$$ around the circle C with equation $\lvert z\rvert = 3$.	5	4