JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATIONS- 2026

B.Tech-VI Semester (CSE/IT/BT)

COURSE CODE (CREDITS):18B1WCI634 (2) MAX MARKS: 35

COURSE NAME: Machine Learning

COURSE INSTRUCTOR: KLK and SKP 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) **Use of a calculator is allowed***

Q. No	Question	CO	Marks
Q1	**(A)** Define the following in brief: (1) 2-point crossover, (2) Local generalization, (3) Kernel function, (4) Pair-wise Independent events, (5) Neighbours in k-NN. **[1X5=5]** **(B)** How is Machine Learning different from Deep Learning? **[2]**	1, 2	7
Q2	Derive the **Schema Theorem.** Consider a population of size N = 10. A schema H has the following parameters: order of schema $o(H) = 2$, defining length $\delta(H) = 4$, average fitness of schema $f(H) = 8$, population average fitness $\bar{f} = 6$, crossover probability pc = 0.6, mutation probability pm = 0.01, and number of instances of schema in the current generation $m(H, t) = 3$. Using the Schema Theorem bound, compute the expected number of instances of schema H in the next generation, i.e., $m(H, t + 1)$. Assume chromosome length = 6. **[4+3]**	3	7
Q2	Point x1 x2 Class y X1 2 2 +1 X2 4 4 +1 X3 2 0 −1 X4 0 2 −1 Explain the concept of a **maximum margin hyperplane** in the context of a linear SVM. Why are only subsets of points called *support vectors* important for defining the decision boundary? Compute the **margin** given the above data and predict the class of point (3, 2). **[2+2+3]**	5	7

Q3	Fill the following Table with Yes/No, High/Low, or appropriate words. **[3]** Write the expressions corresponding to a query (x) that gives a response to (A) classification (B) Regression in an instance-based learning scenario (**assume k-NN**). **[2+2]**	4	7
Q5	Give the statement of Bayes' Theorem with the appropriate assumption. Explain how Maximum-Likelihood estimation is related to Bayes' Theorem. Derive the expression that establishes that Maximum-Likelihood estimation applied to regression problems is actually the minimization of Mean Squared Error. **[1+1+5]**	5	7

Aspect	Model-Based Learning	Instance-Based Learning
Training Cost		
Inference Cost		
Local Generalization		
Sensitivity to Noise		
Memory Requirement		
Type of Learner		