



Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
B.Tech Degree S4 (Hons.) Examinations April 2026 (2024 Admn)

Course Code: HNCST409

Course Name: Advanced Mathematics for Computer Science

Max. Marks: 60

Duration: 2 hours 30 minutes

PART A

(Answer all questions. Each question carries 3 marks)

		CO	Marks
1	Find GCD (1547,560) using Euclidean algorithm	1	(3)
2	Find the last three digits of 7^{222}	1	(3)
3	Explain the role of convexity in optimization problems	2	(3)
4	Define stochastic gradient descent (SGD)	2	(3)
5	State Bayes' theorem	3	(3)
6	Define Markov Chain Monte Carlo (MCMC)	3	(3)
7	State the Max-flow Min-cut theorem	4	(3)
8	What is PageRank algorithm? List two applications of PageRank.	4	(3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

Module -1

9	a)	Define modular inverse. Find the inverse of 7 modulo 26	1	(5)
	b)	Explain Extended Euclidean algorithm with a detailed example.	1	(4)
10	a)	Demonstrate RSA key generation using small primes.	1	(5)
	b)	Describe the solutions of congruences (a) $9x \equiv 12 \pmod{21}$ (b) $27x \equiv 25 \pmod{256}$	1	(4)

Module -2

11	a)	Check whether the set $C=\{(x,y):x+y\leq 1\}$ is convex.	2	(5)
	b)	Explain the importance of learning rate and its effect on optimization	2	(4)
12	a)	Find one iteration of gradient descent for $f(x)=x^2+2x$ starting from $x=2$ with learning rate $\eta=0$	2	(5)
	b)	Compare Batch, Stochastic, and Mini-batch Gradient Descent.	2	(4)

Module -3

- | | | | | |
|----|----|---|---|-----|
| 13 | a) | Derive the conjugate prior for Poisson distribution and show the posterior distribution | 3 | (5) |
| | b) | Explain the Beta-Binomial model. | 3 | (4) |
| 14 | a) | Explain Bayesian parameter estimation with a suitable example | 3 | (5) |
| | b) | Explain credible intervals and their significance. | 3 | (4) |

Module -4

- | | | | | |
|----|----|---|---|-----|
| 15 | a) | Differentiate entropy, cross-entropy, and KL divergence | 4 | (5) |
| | b) | Explain the importance of shortest path algorithms | 4 | (4) |
| 16 | a) | Explain the role of graph theory in computer science | 4 | (5) |
| | b) | Discuss applications of network flow algorithms | 4 | (4) |
