

Reg. No.:

Name :



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MID TERM EXAMINATIONS – November-December 2022

Programme	: B.Tech.[BAI]	Semester	: Interim 2022-23
Course Title /Code	: Convex Optimization/ CSA3002	Slot	: C21+C22+C23
Time	: 1 ½ hours	Max. Marks	: 50

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		Discover optimal solution for the following Linear Programming Problem using the graphical method. Minimize $Z = 20x_1 + 10x_2$ subject to the constraints (i) $x_1 + 2x_2 \leq 40$, (ii) $2x_1 + x_2 \geq 20$, (iii) $4x_1 + 3x_2 \geq 36$ and $x_1, x_2 \geq 0$	10
2		Simplify the following convex optimization problem choosing Simplex Method. Maximize $Z = x_1 + x_2$ subject to $x_1 + 2x_2 \leq 8$ $3x_1 + 2x_2 \leq 12$ and $x_1, x_2 \geq 0$	10
3	(a)	Test for convexity of hyperplane and halfspace.	5
	(b)	We know that the image of hyperplanes and halfspaces under the perspective function $P(x, t) = x/t$, with $\text{dom } P = \mathbb{R}^n \times \mathbb{R}_{++}$. For the convex sets such as Hyperplane $C = \{(v, t) \mid f^T v + gt = h\}$ (with f and g not both zero) and Halfspace $C = \{(v, t) \mid f^T v + gt \leq h\}$ (with f and g not both zero), give a simple description of $P(C) = \{v/t \mid (v, t) \in C, t > 0\}$.	5
4		Inspect the operations such as pointwise maximum/supremum, composition of scalar/vector functions and minimization which preserve convexity of convex functions. Test for the convexity with respect to generalized inequalities.	10
5		Categorize between constrained and unconstrained minimization problems. Analyze the gradient descent algorithm to showcase the working of it with an example.	10

