Some quantum integral inequalities for convex stochastic processes

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Abstract: In this study, the authors obtain the following q-Hermite-Hadamard type inequalities for convex mean-square differentiable stochastic process $S : [\theta,\delta]\times\Sigma\to\mathbb{R}$ on $[\theta,\delta]$ and $0<q<1$ as follows:

$$S\left(\frac{q\theta+\delta}{1+q},\cdot\right)\leq\frac{1}{\delta-\theta}\int_{\theta}^{\delta}S\left(\omega,\cdot\right)\ {}_{\theta}d_{q}\omega\leq\frac{qS\left(\theta,\cdot\right)+S\left(\delta,\cdot\right)}{1+q}; \tag{1}$$

$$\begin{aligned}&S\left(\frac{\theta+\delta}{2},\cdot\right)+\frac{(1-q)\left(\delta-\theta\right)}{2\left(1+q\right)}S'\left(\frac{\theta+\delta}{2},\cdot\right)\\ \leq\ &\frac{1}{\delta-\theta}\int_{\theta}^{\delta}S\left(\omega,\cdot\right)\ {}_{\theta}d_{q}\omega\leq\frac{qS\left(\theta,\cdot\right)+S\left(\delta,\cdot\right)}{1+q};\end{aligned} \tag{2}$$

$$\begin{aligned}&S\left(\frac{\theta+q\delta}{1+q},\cdot\right)+\frac{(1-q)\left(\delta-\theta\right)}{1+q}S'\left(\frac{\theta+q\delta}{1+q},\cdot\right)\\ \leq\ &\frac{1}{\delta-\theta}\int_{\theta}^{\delta}S\left(\omega,\cdot\right)\ {}_{\theta}d_{q}\omega\leq\frac{qS\left(\theta,\cdot\right)+S\left(\delta,\cdot\right)}{1+q}.\end{aligned} \tag{3}$$

Then, the quantum estimates for midpoint type inequalities thank to the above results are verified in this study.

Keywords: Convex stochastic process; mean-square differentiable; q-Hermite-Hadamard inequality.

2010 Mathematics Subject Classification: 26D15, 26D99, 26A51, 46N10.

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