

Table 1: Article Benchmarks - Generic problems with uncorrelated variables

LSF significance	Case No.	Limit State function(s)	Stochastic variable(s)	β	Ref
Iceland shape	(1)	$g(X) = 7 - 8 \exp(-(X_1 + 1)^2 + (X_2 + 1)^2) + 2 \exp(-(X_1 - 5)^2 - (X_2 - 4)^2) + 1 + \frac{X_1 X_2}{10}$	$X_1 : N(2, 1)$ $X_2 : N(2, 1)$	4.0	[1]
With high-frequency, artificial noise term	(2)	$g(X) = X_1 + 2X_2 + 2X_3 + X_4 - 5X_5 - 5X_6 + 0.001 \sum_{i=1}^6 \sin(100X_i)$	$X_{1...4} : LN(120, 12)$ $X_5 : LN(50, 15)$ $X_6 : LN(40, 12)$	2.247	[2, 3]
Cubic performance function	(3)	$g(X) = 2.2257 - \frac{0.025\sqrt{2}}{27}(X_1 + X_2 - 20)^3 + \frac{33}{140}(X_1 - X_2)$	$X_1 : N(10, 3)$ $X_2 : N(10, 3)$	2.07	[4, 5]
Highly Nonlinear	(4)	$g(X) = X_1^3 + X_2^3 - 18$	$X_1 : N(10, 5)$ $X_2 : N(9.9, 5)$	2.52	[6, 5]
Highly Nonlinear	(5)	$g(X) = X_1^3 + X_2^3 - 67.5$	$X_1 : N(10, 5)$ $X_2 : N(9.9, 5)$	2.23	[6]
Highly Nonlinear	(6)	$g(X) = \frac{120}{X_1} - \frac{X_2}{X_1} - 1$	$X_1 : N(4.0, 1.0)$ $X_2 : N(4.0, 1.0)$	4.0	[7]
Quartic performance function	(7)	$g(X) = \frac{5}{2} + \frac{1}{216}(X_1 + X_2 - 20)^4 - \frac{33}{140}(X_1 - X_2)$	$X_1 : N(10.0, 3.0)$ $X_2 : N(10.0, 3.0)$	2.76	[8, 9]
Highly Nonlinear	(8)	$g(X) = X_1^4 + 2X_2^4 - 20$	$X_1 : N(10.0, 5.0)$ $X_2 : N(10.0, 5.0)$	2.90	[10, 9]
With multiple failure points	(9)	$g(X) = X_1 X_2 - 146.14$	$X_1 : N(7.80644 \times 10^4, 1.17097 \times 10^4)$ $X_2 : N(0.0104, 0.00156)$	5.11	[7]
Non-Normal-Nonlinear	(10)	$g(X) = X_1 X_2 - 1140$	$X_1 : LN(38.0, 3.8)$ $X_2 : LN(54.0, 2.7)$	5.21	[11]
Non-Normal-Nonlinear	(11)	$g(X) = X_1 X_2 - 2000X_3$	$X_1 : N(0.32, 0.032)$ $X_2 : N(1.4 \times 10^6, 7.0 \times 10^4)$ $X_3 : LN(100.0, 40.0)$	2.184	[12]
Circle Shape	(12)	$g(X) = 9 - X_1^2 - X_2^2$	$X_1 : N(0.0, 1.0)$ $X_2 : N(0.0, 1.0)$	2.28	[7]
Highly Nonlinear	(13)	$g(X) = 3 - X_2 + (4X_1)^4$	$X_1 : N(0.0, 1.0)$ $X_2 : N(0.0, 1.0)$	3.57	[13]
Nonlinear	(14)	$g(X) = 2 + 0.015 \sum_{i=1}^{10} X_i^2 - X_{10}$	$X_{1...10} : N(0.0, 1.0)$	2.13	[14]
Highly nonlinear with non-convex domains	(15)	$g(X) = 10 - \sum_{i=1}^2 [X_i^2 - 5 \cos(2\pi X_i)]$	$X_1 : N(0.0, 1.0)$ $X_2 : N(0.0, 1.0)$	1.45	[15]
Nonlinear LS with saddle point	(16)	$g(X) = 2 - X_2 - 0.1X_1^2 + 0.06X_3^3$	$X_1 : N(0.0, 1.0)$ $X_2 : N(0.0, 1.0)$ $X_3 : N(0.0, 1.0)$	1.819	[16]
Nonlinear Concave LS	(17)	$g(X) = -0.5(X_1 - X_2)^2 - \frac{X_1 + X_2}{\sqrt{2}} + 3$	$X_1 : N(0.0, 1.0)$ $X_2 : N(0.0, 1.0)$	1.255	[17]
Nonlinear	(18)	$g(X) = -\frac{4}{25}(X_1 - 1)^2 - X_2 + 4$	$X_1 : N(0.0, 1.0)$ $X_2 : N(0.0, 1.0)$	3.156	[18]
Highly Nonlinear	(19)	$g(X) = -0.16(X_1 - 1)^3 - X_2 + 4 - 0.04 \cos(X_1 X_2)$	$X_1 : N(0.0, 1.0)$ $X_2 : N(0.0, 1.0)$	3.73	[19, 9]
Highly Nonlinear	(20)	$g(X) = \frac{1}{40}X_1^4 + 2X_3^3 + X_3 + 3$	$X_1 : N(0.0, 1.0)$ $X_2 : N(0.0, 1.0)$ $X_3 : N(0.0, 1.0)$	3.43	[18]
Highly Nonlinear	(21)	$g(X) = \exp(0.4(X_1 + 2) + 6.2) - \exp(0.3X_2 + 5) - 200$	$X_1 : N(0.0, 1.0)$ $X_2 : N(0.0, 1.0)$	2.709	[20, 9]
Highly Nonlinear	(22)	$g(X) = \exp(0.2X_1 + 1.4) - X_2$	$X_1 : N(0.0, 1.0)$ $X_2 : N(0.0, 1.0)$	3.385	[21, 20]

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Table Continuation 1

LSF significance	Case No.	Limit State function(s)	Stochastic variable(s)	β	Ref
Highly Nonlinear	(23)	$g(X) = X_3 + \left(\frac{X_1 - 1.1}{1.5}\right)^2 - \left(\frac{X_2 - 2}{3.0}\right)^2 + 3.6$	$X_1 : N(0.0, 1.0)$ $X_2 : N(0.0, 1.0)$ $X_3 : N(0.0, 1.0)$	3.705	[9]
Nonlinear	(24)	$g(X) = \exp(0.2X_1 + 6.2) - \exp(0.47X_2 + 5.0)$	$X_1 : N(0.0, 1.0)$ $X_2 : N(0.0, 1.0)$	2.35	[8]

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