

# 给水排水工程结构设计手册

中国建筑工业出版社

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上海市政工程设计院  
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本手册内容包括：给水排水工程结构设计的静力计算、圆形水池、矩形水池、水塔、取水头部及泵房、沉井、管道以及抗震设计等方面的有关设计计算资料。以图表公式为主，辅以相应的文字说明，并列有设计计算实例和部分结构内力分析的电算程序。

本手册可供给水排水工程结构设计人员、一般土建结构设计人员和大专院校有关专业师生参考。

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## 前 言

为了适应给水排水工程结构设计工作的需要,我们编写了本手册。手册共分静力计算、圆形水池、矩形水池、水塔、取水头部及泵房、沉井、管道、抗震设计、有关指标及常用资料等九篇。本书总结了建国以来给水排水工程结构设计中的实践经验、列举了一般常用的设计计算方法、计算图表、计算公式和计算实例,并吸收了部分国外有关设计资料。

由于给水排水工程结构设计涉及面较广,而且目前尚无专用规范,为此,本手册原则上按照工业与民用建筑有关规范编制。使用时,应结合工程特点,查明有关规范和规定进行设计。本手册的编写工作,限于编者水平,难免有错误和疏漏之处,尚请批评指正。

本手册编写工作主持单位:上海市政工程设计院、北京市市政设计院、中国给水排水东北设计院。编写单位:第一篇——上海市政工程设计院,第二篇——中国给水排水中南设计院,第三篇——中国市政工程西北设计院,第四篇——上海市政工程设计院,第五篇——中国市政工程西南设计院、中国市政工程华北设计院,第六篇——中国给水排水东北设计院,第七篇——北京市市政设计院,第八篇——北京市市政设计院,第九篇——上海市政工程设计院、中国市政工程西南设计院。

编 者

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# 第1篇 静力计算

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## 1.1 概 述

给水排水工程结构一般由梁、板、壳三类构件组成。其特点是，结构型式和荷载条件比较复杂。本篇汇编了在结构计算中经常遇到的梁、板、壳以及部分特殊型式的梁、板的静力计算图表和公式。

给水排水工程结构荷载条件：除承受结构荷载、风荷载、雪荷载等一般荷载（这些荷载的选用见现行国家规范）外，还承受水荷载、土荷载、活荷载、车辆荷载以及设备等特殊荷载。这些特殊荷载除列入各有关篇外，其常用者，则列入9.1章内。

此外，本篇还列入了钢筋混凝土结构和砖石结构的构件设计。

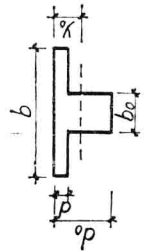
# 1.2 静力计算

## 1.2.1 力学性能、几何图形

1.2.1.1 T形截面的形心及惯性矩系数表

表 1.2.1-1

面积  $A = K_1 b d_0$ ;  $K_1 = \alpha + \beta - \alpha\beta$   
 形心  $y_0 = K_2 d_0$ ;  $K_2 = \frac{\alpha^2(1-\beta) + \beta}{2K_1}$   
 惯性矩  $I_0 = K_3 \frac{b d_0^3}{12}$   
 $K_3 = 4[\beta(1-K_2)^3 + K_2^3 - (1-\beta)(K_2 - \alpha)^3]$



| 系数    | $\alpha$ |       | $\beta$ |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |   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|       | 0.15     | 0.16  | 0.17    | 0.18  | 0.19  | 0.20  | 0.21  | 0.22  | 0.23  | 0.24  | 0.25  | 0.26  | 0.27  | 0.28  | 0.29  | 0.30  | 0.31  | 0.32  | 0.33  | 0.34  | 0.35  | 0.36  | 0.37  | 0.38  | 0.39  | 0.40  | 0.41  | 0.42  | 0.43  | 0.44  | 0.45  | 0.46  | 0.47  | 0.48  | 0.49  | 0.50  | 0.51  | 0.52  | 0.53  | 0.54  | 0.55  | 0.56  | 0.57  | 0.58  | 0.59  | 0.60  |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| $K_1$ | 0.218    | 0.226 | 0.235   | 0.243 | 0.252 | 0.260 | 0.269 | 0.278 | 0.286 | 0.294 | 0.303 | 0.311 | 0.320 | 0.328 | 0.336 | 0.344 | 0.352 | 0.360 | 0.368 | 0.376 | 0.384 | 0.392 | 0.400 | 0.408 | 0.416 | 0.424 | 0.432 | 0.440 | 0.448 | 0.456 | 0.464 | 0.472 | 0.480 | 0.488 | 0.496 | 0.504 | 0.512 | 0.520 | 0.528 | 0.536 | 0.544 | 0.552 | 0.560 | 0.568 | 0.576 | 0.584 | 0.592 | 0.600 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |   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|       | 0.227    | 0.236 | 0.244   | 0.252 | 0.261 | 0.270 | 0.278 | 0.286 | 0.294 | 0.303 | 0.311 | 0.320 | 0.328 | 0.336 | 0.344 | 0.352 | 0.360 | 0.368 | 0.376 | 0.384 | 0.392 | 0.400 | 0.408 | 0.416 | 0.424 | 0.432 | 0.440 | 0.448 | 0.456 | 0.464 | 0.472 | 0.480 | 0.488 | 0.496 | 0.504 | 0.512 | 0.520 | 0.528 | 0.536 | 0.544 | 0.552 | 0.560 | 0.568 | 0.576 | 0.584 | 0.592 | 0.600 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |   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|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|       | 0.236    | 0.245 | 0.253   | 0.261 | 0.270 | 0.278 | 0.287 | 0.295 | 0.303 | 0.311 | 0.320 | 0.328 | 0.336 | 0.344 | 0.352 | 0.360 | 0.368 | 0.376 | 0.384 | 0.392 | 0.400 | 0.408 | 0.416 | 0.424 | 0.432 | 0.440 | 0.448 | 0.456 | 0.464 | 0.472 | 0.480 | 0.488 | 0.496 | 0.504 | 0.512 | 0.520 | 0.528 | 0.536 | 0.544 | 0.552 | 0.560 | 0.568 | 0.576 | 0.584 | 0.592 | 0.600 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|       | 0.246    | 0.254 | 0.262   | 0.270 | 0.278 | 0.287 | 0.295 | 0.303 | 0.311 | 0.320 | 0.328 | 0.336 | 0.344 | 0.352 | 0.360 | 0.368 | 0.376 | 0.384 | 0.392 | 0.400 | 0.408 | 0.416 | 0.424 | 0.432 | 0.440 | 0.448 | 0.456 | 0.464 | 0.472 | 0.480 | 0.488 | 0.496 | 0.504 | 0.512 | 0.520 | 0.528 | 0.536 | 0.544 | 0.552 | 0.560 | 0.568 | 0.576 | 0.584 | 0.592 | 0.600 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|       | 0.255    | 0.263 | 0.271   | 0.279 | 0.287 | 0.295 | 0.303 | 0.311 | 0.320 | 0.328 | 0.336 | 0.344 | 0.352 | 0.360 | 0.368 | 0.376 | 0.384 | 0.392 | 0.400 | 0.408 | 0.416 | 0.424 | 0.432 | 0.440 | 0.448 | 0.456 | 0.464 | 0.472 | 0.480 | 0.488 | 0.496 | 0.504 | 0.512 | 0.520 | 0.528 | 0.536 | 0.544 | 0.552 | 0.560 | 0.568 | 0.576 | 0.584 | 0.592 | 0.600 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|       | 0.264    | 0.272 | 0.280   | 0.288 | 0.296 | 0.304 | 0.312 | 0.320 | 0.328 | 0.336 | 0.344 | 0.352 | 0.360 | 0.368 | 0.376 | 0.384 | 0.392 | 0.400 | 0.408 | 0.416 | 0.424 | 0.432 | 0.440 | 0.448 | 0.456 | 0.464 | 0.472 | 0.480 | 0.488 | 0.496 | 0.504 | 0.512 | 0.520 | 0.528 | 0.536 | 0.544 | 0.552 | 0.560 | 0.568 | 0.576 | 0.584 | 0.592 | 0.600 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|       | 0.282    | 0.290 | 0.298   | 0.306 | 0.314 | 0.321 | 0.329 | 0.337 | 0.345 | 0.353 | 0.361 | 0.369 | 0.377 | 0.385 | 0.393 | 0.401 | 0.409 | 0.417 | 0.425 | 0.433 | 0.441 | 0.449 | 0.457 | 0.465 | 0.473 | 0.481 | 0.489 | 0.497 | 0.505 | 0.513 | 0.521 | 0.529 | 0.537 | 0.545 | 0.553 | 0.561 | 0.569 | 0.577 | 0.585 | 0.593 | 0.601 | 0.609 | 0.617 | 0.625 | 0.633 | 0.641 | 0.649 | 0.657 | 0.665 | 0.673 | 0.681 | 0.689 | 0.697 | 0.705 | 0.713 | 0.721 | 0.729 | 0.737 | 0.745 | 0.753 | 0.761 | 0.769 | 0.777 | 0.785 | 0.793 | 0.801 | 0.809 | 0.817 | 0.825 | 0.833 | 0.841 | 0.849 | 0.857 | 0.865 | 0.873 | 0.881 | 0.889 | 0.897 | 0.905 | 0.913 | 0.921 | 0.929 | 0.937 | 0.945 | 0.953 | 0.961 | 0.969 | 0.977 | 0.985 | 0.993 | 1.001 | 1.009 | 1.017 | 1.025 | 1.033 | 1.041 | 1.049 | 1.057 | 1.065 | 1.073 | 1.081 | 1.089 | 1.097 | 1.105 | 1.113 | 1.121 | 1.129 | 1.137 | 1.145 | 1.153 | 1.161 | 1.169 | 1.177 | 1.185 | 1.193 | 1.201 | 1.209 | 1.217 | 1.225 | 1.233 | 1.241 | 1.249 | 1.257 | 1.265 | 1.273 | 1.281 | 1.289 | 1.297 | 1.305 | 1.313 | 1.321 | 1.329 | 1.337 | 1.345 | 1.353 | 1.361 | 1.369 | 1.377 | 1.385 | 1.393 | 1.401 | 1.409 | 1.417 | 1.425 | 1.433 | 1.441 | 1.449 | 1.457 | 1.465 | 1.473 | 1.481 | 1.489 | 1.497 | 1.505 | 1.513 | 1.521 | 1.529 | 1.537 | 1.545 | 1.553 | 1.561 | 1.569 | 1.577 | 1.585 | 1.593 | 1.601 | 1.609 | 1.617 | 1.625 | 1.633 | 1.641 | 1.649 | 1.657 | 1.665 | 1.673 | 1.681 | 1.689 | 1.697 | 1.705 | 1.713 | 1.721 | 1.729 | 1.737 | 1.745 | 1.753 | 1.761 | 1.769 | 1.777 | 1.785 | 1.793 | 1.801 | 1.809 | 1.817 | 1.825 | 1.833 | 1.841 | 1.849 | 1.857 | 1.865 | 1.873 | 1.881 | 1.889 | 1.897 | 1.905 | 1.913 | 1.921 | 1.929 | 1.937 | 1.945 | 1.953 | 1.961 | 1.969 | 1.977 | 1.985 | 1.993 | 2.001 | 2.009 | 2.017 | 2.025 | 2.033 | 2.041 | 2.049 | 2.057 | 2.065 | 2.073 | 2.081 | 2.089 | 2.097 | 2.105 | 2.113 | 2.121 | 2.129 | 2.137 | 2.145 | 2.153 | 2.161 | 2.169 | 2.177 | 2.185 | 2.193 | 2.201 | 2.209 | 2.217 | 2.225 | 2.233 | 2.241 | 2.249 | 2.257 | 2.265 | 2.273 | 2.281 | 2.289 | 2.297 | 2.305 | 2.313 | 2.321 | 2.329 | 2.337 | 2.345 | 2.353 | 2.361 | 2.369 | 2.377 | 2.385 | 2.393 | 2.401 | 2.409 | 2.417 | 2.425 | 2.433 | 2.441 | 2.449 | 2.457 | 2.465 | 2.473 | 2.481 | 2.489 | 2.497 | 2.505 | 2.513 | 2.521 | 2.529 | 2.537 | 2.545 | 2.553 | 2.561 | 2.569 | 2.577 | 2.585 | 2.593 | 2.601 | 2.609 | 2.617 | 2.625 | 2.633 | 2.641 | 2.649 | 2.657 | 2.665 | 2.673 | 2.681 | 2.689 | 2.697 | 2.705 | 2.713 | 2.721 | 2.729 | 2.737 | 2.745 | 2.753 | 2.761 | 2.769 | 2.777 | 2.785 | 2.793 | 2.801 | 2.809 | 2.817 | 2.825 | 2.833 | 2.841 | 2.849 | 2.857 | 2.865 | 2.873 | 2.881 | 2.889 | 2.897 | 2.905 | 2.913 | 2.921 | 2.929 | 2.937 | 2.945 | 2.953 | 2.961 | 2.969 | 2.977 | 2.985 | 2.993 | 3.001 | 3.009 | 3.017 | 3.025 | 3.033 | 3.041 | 3.049 | 3.057 | 3.065 | 3.073 | 3.081 | 3.089 | 3.097 | 3.105 | 3.113 | 3.121 | 3.129 | 3.137 | 3.145 | 3.153 | 3.161 | 3.169 | 3.177 | 3.185 | 3.193 | 3.201 | 3.209 | 3.217 | 3.225 | 3.233 | 3.241 | 3.249 | 3.257 | 3.265 | 3.273 | 3.281 | 3.289 | 3.297 | 3.305 | 3.313 | 3.321 | 3.329 | 3.337 | 3.345 | 3.353 | 3.361 | 3.369 | 3.377 | 3.385 | 3.393 | 3.401 | 3.409 | 3.417 | 3.425 | 3.433 | 3.441 | 3.449 | 3.457 | 3.465 | 3.473 | 3.481 | 3.489 | 3.497 | 3.505 | 3.513 | 3.521 | 3.529 | 3.537 | 3.545 | 3.553 | 3.561 | 3.569 | 3.577 | 3.585 | 3.593 | 3.601 | 3.609 | 3.617 | 3.625 | 3.633 | 3.641 | 3.649 | 3.657 | 3.665 | 3.673 | 3.681 | 3.689 | 3.697 | 3.705 | 3.713 | 3.721 | 3.729 | 3.737 | 3.745 | 3.753 | 3.761 | 3.769 | 3.777 | 3.785 | 3.793 | 3.801 | 3.809 | 3.817 | 3.825 | 3.833 | 3.841 | 3.849 | 3.857 | 3.865 | 3.873 | 3.881 | 3.889 | 3.897 | 3.905 | 3.913 | 3.921 | 3.929 | 3.937 | 3.945 | 3.953 | 3.961 | 3.969 | 3.977 | 3.985 | 3.993 | 4.001 | 4.009 | 4.017 | 4.025 | 4.033 | 4.041 | 4.049 | 4.057 | 4.065 | 4.073 | 4.081 | 4.089 | 4.097 | 4.105 | 4.113 | 4.121 | 4.129 | 4.137 | 4.145 | 4.153 | 4.161 | 4.169 | 4.177 | 4.185 | 4.193 | 4.201 | 4.209 | 4.217 | 4.225 | 4.233 | 4.241 | 4.249 | 4.257 | 4.265 | 4.273 | 4.281 | 4.289 | 4.297 | 4.305 | 4.313 | 4.321 | 4.329 | 4.337 | 4.345 | 4.353 | 4.361 | 4.369 | 4.377 | 4.385 | 4.393 | 4.401 | 4.409 | 4.417 | 4.425 | 4.433 | 4.441 | 4.449 | 4.457 | 4.465 | 4.473 | 4.481 | 4.489 | 4.497 | 4.505 | 4.513 | 4.521 | 4.529 | 4.537 | 4.545 | 4.553 | 4.561 | 4.569 | 4.577 | 4.585 | 4.593 | 4.601 | 4.609 | 4.617 | 4.625 | 4.633 | 4.641 | 4.649 | 4.657 | 4.665 | 4.673 | 4.681 | 4.689 | 4.697 | 4.705 | 4.713 | 4.721 | 4.729 | 4.737 | 4.745 | 4.753 | 4.761 | 4.769 | 4.777 | 4.785 | 4.793 | 4.801 | 4.809 | 4.817 | 4.825 | 4.833 | 4.841 | 4.849 | 4.857 | 4.865 | 4.873 | 4.881 | 4.889 | 4.897 | 4.905 | 4.913 | 4.921 | 4.929 | 4.937 | 4.945 | 4.953 | 4.961 | 4.969 | 4.977 | 4.985 | 4.993 | 5.001 | 5.009 | 5.017 | 5.025 | 5.033 | 5.041 | 5.049 | 5.057 | 5.065 | 5.073 | 5.081 | 5.089 | 5.097 | 5.105 | 5.113 | 5.121 | 5.129 | 5.137 | 5.145 | 5.153 | 5.161 | 5.169 | 5.177 | 5.185 | 5.193 | 5.201 | 5.209 | 5.217 | 5.225 | 5.233 | 5.241 | 5.249 | 5.257 | 5.265 | 5.273 | 5.281 | 5.289 | 5.297 | 5.305 | 5.313 | 5.321 | 5.329 | 5.337 | 5.345 | 5.353 | 5.361 | 5.369 | 5.377 | 5.385 | 5.393 | 5.401 | 5.409 | 5.417 | 5.425 | 5.433 | 5.441 | 5.449 | 5.457 | 5.465 | 5.473 | 5.481 | 5.489 | 5.497 | 5.505 | 5.513 | 5.521 | 5.529 | 5.537 | 5.545 | 5.553 | 5.561 | 5.569 | 5.577 | 5.585 | 5.593 | 5.601 | 5.609 | 5.617 | 5.625 | 5.633 | 5.641 | 5.649 | 5.657 | 5.665 | 5.673 | 5.681 | 5.689 | 5.697 | 5.705 | 5.713 | 5.721 | 5.729 | 5.737 | 5.745 | 5.753 | 5.761 | 5.769 | 5.777 | 5.785 | 5.793 | 5.801 | 5.809 | 5.817 | 5.825 | 5.833 | 5.841 | 5.849 | 5.857 | 5.865 | 5.873 | 5.881 | 5.889 | 5.897 | 5.905 | 5.913 | 5.921 | 5.929 | 5.937 | 5.945 | 5.953 | 5.961 | 5.969 | 5.977 | 5.985 | 5.993 | 6.001 | 6.009 | 6.017 | 6.025 | 6.033 | 6.041 | 6.049 | 6.057 | 6.065 | 6.073 | 6.081 | 6.089 | 6.097 | 6.105 | 6.113 | 6.121 | 6.129 | 6.137 | 6.145 | 6.153 | 6.161 | 6.169 | 6.177 | 6.185 | 6.193 | 6.201 | 6.209 | 6.217 | 6.225 | 6.233 | 6.241 | 6.249 | 6.257 | 6.265 | 6.273 | 6.281 | 6.289 | 6.297 | 6.305 | 6.313 | 6.321 | 6.329 | 6.337 | 6.345 | 6.353 | 6.361 | 6.369 | 6.377 | 6.385 | 6.393 | 6.401 | 6.409 | 6.417 | 6.425 | 6.433 | 6.441 | 6.449 | 6.457 | 6.465 | 6.473 | 6.481 | 6.489 | 6.497 | 6.505 | 6.513 | 6.521 | 6.529 | 6.537 | 6.545 | 6.553 | 6.561 | 6.569 | 6.577 | 6.585 | 6.593 | 6.601 | 6.609 | 6.617 | 6.625 | 6.633 | 6.641 | 6.649 | 6.657 | 6.665 | 6.673 | 6.681 | 6.689 | 6.697 | 6.705 | 6.713 | 6.721 | 6.729 | 6.737 | 6.745 | 6.753 | 6.761 | 6.769 | 6.777 | 6.785 | 6.793 | 6.801 | 6.809 | 6.817 | 6.825 | 6.833 | 6.841 | 6.849 | 6.857 | 6.865 | 6.873 | 6.881 | 6.889 | 6.897 | 6.905 | 6.913 | 6.921 | 6.929 | 6.937 | 6.945 | 6.953 | 6.961 | 6.969 | 6.977 | 6.985 | 6.993 | 7.001 | 7.009 | 7.017 | 7.025 | 7.033 | 7.041 | 7.049 | 7.057 |

续表

| 系数    | $\alpha$ |       | $\beta$ |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|-------|----------|-------|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|       | 0.08     | 0.09  | 0.10    | 0.11  | 0.12  | 0.13  | 0.14  | 0.16  | 0.18  | 0.20  | 0.24  | 0.28  | 0.32  | 0.36  | 0.40  | 0.45  | 0.50  | 0.55  | 0.60  |
| $K_1$ | 0.30     | 0.356 | 0.370   | 0.377 | 0.384 | 0.391 | 0.398 | 0.412 | 0.426 | 0.440 | 0.468 | 0.496 | 0.524 | 0.552 | 0.580 | 0.615 | 0.650 | 0.685 | 0.720 |
|       | 0.32     | 0.374 | 0.388   | 0.395 | 0.402 | 0.408 | 0.415 | 0.429 | 0.442 | 0.456 | 0.483 | 0.510 | 0.538 | 0.565 | 0.592 | 0.626 | 0.660 | 0.694 | 0.728 |
|       | 0.34     | 0.393 | 0.406   | 0.413 | 0.419 | 0.426 | 0.432 | 0.446 | 0.459 | 0.472 | 0.498 | 0.525 | 0.551 | 0.578 | 0.604 | 0.637 | 0.670 | 0.703 | 0.736 |
|       | 0.36     | 0.411 | 0.418   | 0.424 | 0.430 | 0.437 | 0.443 | 0.450 | 0.462 | 0.475 | 0.488 | 0.514 | 0.539 | 0.565 | 0.590 | 0.616 | 0.648 | 0.680 | 0.714 |
|       | 0.38     | 0.430 | 0.436   | 0.442 | 0.448 | 0.454 | 0.461 | 0.467 | 0.479 | 0.492 | 0.504 | 0.529 | 0.554 | 0.578 | 0.603 | 0.628 | 0.659 | 0.690 | 0.721 |
|       | 0.40     | 0.448 | 0.454   | 0.460 | 0.466 | 0.472 | 0.478 | 0.484 | 0.496 | 0.508 | 0.520 | 0.544 | 0.568 | 0.592 | 0.616 | 0.640 | 0.670 | 0.700 | 0.730 |
|       | 0.42     | 0.466 | 0.472   | 0.478 | 0.484 | 0.490 | 0.495 | 0.501 | 0.513 | 0.524 | 0.536 | 0.559 | 0.582 | 0.605 | 0.628 | 0.651 | 0.681 | 0.710 | 0.739 |
|       | 0.44     | 0.485 | 0.490   | 0.496 | 0.502 | 0.507 | 0.513 | 0.518 | 0.530 | 0.541 | 0.552 | 0.574 | 0.597 | 0.619 | 0.642 | 0.664 | 0.692 | 0.720 | 0.748 |
|       | 0.46     | 0.503 | 0.509   | 0.514 | 0.519 | 0.525 | 0.530 | 0.536 | 0.546 | 0.557 | 0.568 | 0.590 | 0.611 | 0.633 | 0.654 | 0.676 | 0.703 | 0.730 | 0.757 |
|       | 0.48     | 0.522 | 0.527   | 0.532 | 0.537 | 0.542 | 0.548 | 0.553 | 0.563 | 0.574 | 0.584 | 0.605 | 0.626 | 0.646 | 0.667 | 0.688 | 0.714 | 0.740 | 0.766 |
|       | 0.50     | 0.540 | 0.545   | 0.550 | 0.555 | 0.560 | 0.565 | 0.570 | 0.580 | 0.590 | 0.600 | 0.620 | 0.640 | 0.660 | 0.680 | 0.700 | 0.725 | 0.750 | 0.780 |
|       | 0.52     | 0.556 | 0.563   | 0.568 | 0.573 | 0.578 | 0.582 | 0.587 | 0.597 | 0.606 | 0.616 | 0.635 | 0.654 | 0.674 | 0.693 | 0.712 | 0.736 | 0.760 | 0.784 |
|       | 0.54     | 0.577 | 0.581   | 0.586 | 0.591 | 0.595 | 0.600 | 0.604 | 0.614 | 0.623 | 0.632 | 0.650 | 0.669 | 0.687 | 0.706 | 0.724 | 0.747 | 0.770 | 0.793 |
|       | 0.56     | 0.595 | 0.600   | 0.604 | 0.608 | 0.613 | 0.617 | 0.622 | 0.630 | 0.639 | 0.648 | 0.666 | 0.683 | 0.701 | 0.718 | 0.736 | 0.758 | 0.780 | 0.802 |
|       | 0.58     | 0.614 | 0.618   | 0.622 | 0.626 | 0.630 | 0.635 | 0.639 | 0.647 | 0.656 | 0.664 | 0.681 | 0.698 | 0.714 | 0.731 | 0.748 | 0.769 | 0.790 | 0.811 |
|       | 0.60     | 0.632 | 0.636   | 0.640 | 0.644 | 0.648 | 0.652 | 0.656 | 0.664 | 0.672 | 0.680 | 0.696 | 0.712 | 0.728 | 0.744 | 0.760 | 0.780 | 0.800 | 0.820 |
| $K_2$ | 0.15     | 0.357 | 0.337   | 0.329 | 0.322 | 0.315 | 0.310 | 0.300 | 0.293 | 0.288 | 0.281 | 0.279 | 0.281 | 0.285 | 0.292 | 0.302 | 0.316 | 0.329 | 0.345 |
|       | 0.16     | 0.364 | 0.354   | 0.337 | 0.330 | 0.324 | 0.318 | 0.308 | 0.301 | 0.295 | 0.288 | 0.286 | 0.287 | 0.291 | 0.297 | 0.307 | 0.319 | 0.333 | 0.348 |
|       | 0.17     | 0.371 | 0.361   | 0.345 | 0.337 | 0.331 | 0.325 | 0.316 | 0.308 | 0.302 | 0.295 | 0.292 | 0.293 | 0.296 | 0.302 | 0.311 | 0.322 | 0.336 | 0.351 |
|       | 0.18     | 0.377 | 0.368   | 0.359 | 0.351 | 0.344 | 0.338 | 0.333 | 0.323 | 0.315 | 0.309 | 0.302 | 0.298 | 0.298 | 0.301 | 0.308 | 0.315 | 0.326 | 0.339 |
|       | 0.19     | 0.383 | 0.374   | 0.365 | 0.358 | 0.351 | 0.345 | 0.339 | 0.330 | 0.322 | 0.316 | 0.308 | 0.304 | 0.304 | 0.306 | 0.314 | 0.319 | 0.330 | 0.342 |
|       | 0.20     | 0.388 | 0.380   | 0.371 | 0.364 | 0.357 | 0.351 | 0.346 | 0.336 | 0.328 | 0.322 | 0.314 | 0.310 | 0.309 | 0.311 | 0.315 | 0.323 | 0.333 | 0.345 |
|       | 0.22     | 0.398 | 0.390   | 0.382 | 0.375 | 0.369 | 0.363 | 0.357 | 0.344 | 0.340 | 0.334 | 0.325 | 0.321 | 0.319 | 0.324 | 0.331 | 0.340 | 0.351 | 0.364 |
|       | 0.24     | 0.407 | 0.399   | 0.392 | 0.385 | 0.379 | 0.373 | 0.368 | 0.359 | 0.351 | 0.345 | 0.336 | 0.331 | 0.329 | 0.330 | 0.332 | 0.338 | 0.347 | 0.357 |
|       | 0.26     | 0.415 | 0.407   | 0.400 | 0.394 | 0.388 | 0.383 | 0.377 | 0.369 | 0.361 | 0.355 | 0.346 | 0.340 | 0.338 | 0.338 | 0.340 | 0.345 | 0.353 | 0.363 |
|       | 0.28     | 0.422 | 0.414   | 0.408 | 0.402 | 0.396 | 0.391 | 0.386 | 0.378 | 0.370 | 0.364 | 0.355 | 0.349 | 0.347 | 0.346 | 0.348 | 0.352 | 0.359 | 0.369 |
|       | 0.30     | 0.428 | 0.421   | 0.415 | 0.409 | 0.404 | 0.399 | 0.394 | 0.386 | 0.379 | 0.373 | 0.364 | 0.358 | 0.355 | 0.354 | 0.355 | 0.359 | 0.365 | 0.374 |
|       | 0.32     | 0.433 | 0.427   | 0.421 | 0.416 | 0.411 | 0.406 | 0.401 | 0.393 | 0.387 | 0.381 | 0.372 | 0.366 | 0.362 | 0.361 | 0.362 | 0.366 | 0.371 | 0.379 |
|       | 0.34     | 0.438 | 0.432   | 0.427 | 0.422 | 0.417 | 0.412 | 0.408 | 0.400 | 0.394 | 0.388 | 0.379 | 0.379 | 0.370 | 0.368 | 0.372 | 0.377 | 0.384 | 0.392 |
|       | 0.36     | 0.443 | 0.437   | 0.432 | 0.427 | 0.423 | 0.418 | 0.414 | 0.407 | 0.401 | 0.395 | 0.386 | 0.380 | 0.377 | 0.375 | 0.378 | 0.383 | 0.389 | 0.397 |
|       | 0.38     | 0.447 | 0.442   | 0.437 | 0.432 | 0.428 | 0.424 | 0.420 | 0.413 | 0.407 | 0.402 | 0.393 | 0.387 | 0.383 | 0.382 | 0.384 | 0.388 | 0.394 | 0.401 |
|       | 0.40     | 0.451 | 0.446   | 0.441 | 0.437 | 0.433 | 0.429 | 0.425 | 0.419 | 0.413 | 0.408 | 0.399 | 0.394 | 0.390 | 0.388 | 0.389 | 0.390 | 0.393 | 0.399 |
| 0.42  | 0.454    | 0.450 | 0.445   | 0.441 | 0.437 | 0.434 | 0.430 | 0.424 | 0.418 | 0.413 | 0.405 | 0.400 | 0.396 | 0.394 | 0.393 | 0.395 | 0.397 | 0.403 |       |
| 0.44  | 0.457    | 0.453 | 0.449   | 0.445 | 0.442 | 0.438 | 0.435 | 0.429 | 0.424 | 0.419 | 0.411 | 0.405 | 0.402 | 0.399 | 0.399 | 0.400 | 0.403 | 0.407 |       |
| 0.46  | 0.461    | 0.457 | 0.453   | 0.449 | 0.446 | 0.442 | 0.439 | 0.434 | 0.428 | 0.424 | 0.416 | 0.411 | 0.407 | 0.405 | 0.403 | 0.405 | 0.408 | 0.412 |       |
| 0.48  | 0.463    | 0.460 | 0.456   | 0.453 | 0.449 | 0.446 | 0.443 | 0.438 | 0.433 | 0.429 | 0.422 | 0.416 | 0.412 | 0.410 | 0.409 | 0.410 | 0.413 | 0.416 |       |



续表

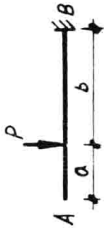
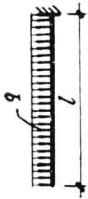
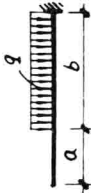
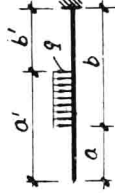
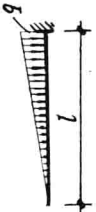
| 系数    | $\alpha$ |       | $\beta$ |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|-------|----------|-------|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|       | 0.08     | 0.09  | 0.10    | 0.11  | 0.12  | 0.13  | 0.14  | 0.16  | 0.18  | 0.20  | 0.24  | 0.28  | 0.32  | 0.36  | 0.40  | 0.45  | 0.50  | 0.55  | 0.60  |       |       |
| $K_2$ | 0.50     | 0.466 | 0.462   | 0.459 | 0.456 | 0.453 | 0.450 | 0.447 | 0.442 | 0.437 | 0.433 | 0.426 | 0.421 | 0.418 | 0.415 | 0.414 | 0.415 | 0.417 | 0.420 | 0.425 |       |
|       | 0.52     | 0.468 | 0.465   | 0.462 | 0.459 | 0.456 | 0.453 | 0.451 | 0.446 | 0.442 | 0.438 | 0.431 | 0.426 | 0.423 | 0.420 | 0.419 | 0.420 | 0.421 | 0.424 | 0.429 |       |
|       | 0.54     | 0.471 | 0.468   | 0.465 | 0.462 | 0.459 | 0.457 | 0.454 | 0.450 | 0.445 | 0.442 | 0.436 | 0.431 | 0.427 | 0.424 | 0.424 | 0.425 | 0.425 | 0.428 | 0.432 |       |
|       | 0.56     | 0.473 | 0.470   | 0.467 | 0.464 | 0.462 | 0.460 | 0.457 | 0.453 | 0.449 | 0.446 | 0.440 | 0.435 | 0.432 | 0.429 | 0.428 | 0.428 | 0.430 | 0.432 | 0.436 |       |
|       | 0.58     | 0.475 | 0.472   | 0.470 | 0.467 | 0.465 | 0.463 | 0.460 | 0.456 | 0.453 | 0.449 | 0.444 | 0.439 | 0.436 | 0.434 | 0.433 | 0.432 | 0.434 | 0.436 | 0.440 |       |
|       | 0.60     | 0.477 | 0.474   | 0.472 | 0.470 | 0.467 | 0.465 | 0.463 | 0.460 | 0.456 | 0.453 | 0.448 | 0.443 | 0.440 | 0.438 | 0.437 | 0.437 | 0.438 | 0.440 | 0.443 |       |
|       | 0.15     | 0.269 | 0.276   | 0.283 | 0.288 | 0.293 | 0.296 | 0.300 | 0.304 | 0.308 | 0.310 | 0.312 | 0.312 | 0.312 | 0.312 | 0.313 | 0.313 | 0.313 | 0.314 | 0.316 | 0.386 |
|       | 0.16     | 0.281 | 0.289   | 0.295 | 0.300 | 0.305 | 0.309 | 0.313 | 0.318 | 0.322 | 0.324 | 0.326 | 0.327 | 0.327 | 0.327 | 0.328 | 0.331 | 0.338 | 0.351 | 0.372 | 0.718 |
|       | 0.17     | 0.292 | 0.300   | 0.306 | 0.312 | 0.317 | 0.322 | 0.326 | 0.331 | 0.335 | 0.338 | 0.340 | 0.341 | 0.341 | 0.341 | 0.342 | 0.344 | 0.352 | 0.360 | 0.384 | 0.104 |
|       | 0.18     | 0.302 | 0.311   | 0.318 | 0.324 | 0.329 | 0.334 | 0.338 | 0.344 | 0.348 | 0.351 | 0.354 | 0.355 | 0.355 | 0.355 | 0.356 | 0.359 | 0.368 | 0.377 | 0.396 | 0.421 |
| 0.19  | 0.313    | 0.321 | 0.329   | 0.335 | 0.341 | 0.346 | 0.350 | 0.356 | 0.361 | 0.364 | 0.368 | 0.369 | 0.369 | 0.369 | 0.369 | 0.370 | 0.380 | 0.388 | 0.404 | 0.428 |       |
| 0.20  | 0.324    | 0.332 | 0.340   | 0.346 | 0.352 | 0.357 | 0.361 | 0.368 | 0.374 | 0.377 | 0.381 | 0.382 | 0.382 | 0.382 | 0.382 | 0.382 | 0.392 | 0.403 | 0.420 | 0.440 |       |
| 0.22  | 0.314    | 0.323 | 0.331   | 0.337 | 0.343 | 0.349 | 0.354 | 0.361 | 0.367 | 0.371 | 0.377 | 0.381 | 0.382 | 0.382 | 0.382 | 0.382 | 0.392 | 0.403 | 0.420 | 0.440 |       |
| 0.24  | 0.364    | 0.373 | 0.381   | 0.388 | 0.395 | 0.401 | 0.406 | 0.414 | 0.420 | 0.425 | 0.430 | 0.432 | 0.432 | 0.433 | 0.436 | 0.437 | 0.438 | 0.452 | 0.477 | 0.456 |       |
| 0.26  | 0.383    | 0.392 | 0.401   | 0.408 | 0.415 | 0.421 | 0.426 | 0.435 | 0.442 | 0.447 | 0.453 | 0.456 | 0.456 | 0.456 | 0.460 | 0.462 | 0.464 | 0.472 | 0.492 | 0.472 |       |
| 0.28  | 0.402    | 0.411 | 0.420   | 0.428 | 0.435 | 0.441 | 0.446 | 0.456 | 0.463 | 0.468 | 0.475 | 0.478 | 0.479 | 0.479 | 0.480 | 0.484 | 0.488 | 0.500 | 0.512 | 0.512 |       |
| 0.30  | 0.420    | 0.430 | 0.439   | 0.447 | 0.454 | 0.460 | 0.466 | 0.475 | 0.483 | 0.489 | 0.496 | 0.500 | 0.501 | 0.501 | 0.502 | 0.504 | 0.508 | 0.520 | 0.532 | 0.532 |       |
| 0.32  | 0.438    | 0.448 | 0.457   | 0.465 | 0.472 | 0.479 | 0.485 | 0.495 | 0.503 | 0.509 | 0.517 | 0.521 | 0.521 | 0.522 | 0.523 | 0.528 | 0.532 | 0.544 | 0.548 | 0.548 |       |
| 0.34  | 0.456    | 0.466 | 0.475   | 0.483 | 0.490 | 0.497 | 0.503 | 0.513 | 0.521 | 0.528 | 0.536 | 0.541 | 0.542 | 0.543 | 0.544 | 0.548 | 0.556 | 0.568 | 0.568 | 0.568 |       |
| 0.36  | 0.474    | 0.484 | 0.493   | 0.501 | 0.508 | 0.515 | 0.521 | 0.531 | 0.540 | 0.546 | 0.555 | 0.560 | 0.562 | 0.562 | 0.564 | 0.572 | 0.568 | 0.576 | 0.589 | 0.589 |       |
| 0.38  | 0.492    | 0.501 | 0.510   | 0.518 | 0.526 | 0.532 | 0.538 | 0.549 | 0.558 | 0.564 | 0.574 | 0.579 | 0.581 | 0.582 | 0.584 | 0.588 | 0.589 | 0.596 | 0.604 | 0.604 |       |
| 0.40  | 0.509    | 0.519 | 0.527   | 0.535 | 0.543 | 0.550 | 0.556 | 0.566 | 0.575 | 0.582 | 0.592 | 0.597 | 0.600 | 0.600 | 0.602 | 0.604 | 0.606 | 0.612 | 0.616 | 0.616 |       |
| 0.42  | 0.526    | 0.536 | 0.544   | 0.552 | 0.560 | 0.566 | 0.573 | 0.583 | 0.592 | 0.599 | 0.609 | 0.615 | 0.618 | 0.618 | 0.620 | 0.622 | 0.624 | 0.628 | 0.632 | 0.632 |       |
| 0.44  | 0.544    | 0.553 | 0.561   | 0.569 | 0.576 | 0.583 | 0.589 | 0.600 | 0.609 | 0.616 | 0.626 | 0.632 | 0.635 | 0.636 | 0.640 | 0.642 | 0.644 | 0.648 | 0.652 | 0.652 |       |
| 0.46  | 0.561    | 0.570 | 0.578   | 0.586 | 0.593 | 0.599 | 0.606 | 0.616 | 0.625 | 0.632 | 0.643 | 0.649 | 0.652 | 0.653 | 0.656 | 0.658 | 0.659 | 0.664 | 0.668 | 0.668 |       |
| 0.48  | 0.577    | 0.586 | 0.595   | 0.602 | 0.609 | 0.616 | 0.622 | 0.632 | 0.641 | 0.648 | 0.659 | 0.665 | 0.668 | 0.670 | 0.671 | 0.672 | 0.673 | 0.676 | 0.684 | 0.684 |       |
| 0.50  | 0.594    | 0.603 | 0.611   | 0.618 | 0.625 | 0.632 | 0.638 | 0.648 | 0.657 | 0.664 | 0.675 | 0.681 | 0.685 | 0.686 | 0.687 | 0.688 | 0.690 | 0.692 | 0.700 | 0.700 |       |
| 0.52  | 0.611    | 0.619 | 0.627   | 0.635 | 0.641 | 0.648 | 0.653 | 0.664 | 0.672 | 0.679 | 0.690 | 0.697 | 0.700 | 0.702 | 0.704 | 0.705 | 0.706 | 0.708 | 0.712 | 0.712 |       |
| 0.54  | 0.628    | 0.636 | 0.643   | 0.651 | 0.657 | 0.663 | 0.669 | 0.679 | 0.688 | 0.695 | 0.705 | 0.712 | 0.716 | 0.717 | 0.720 | 0.722 | 0.724 | 0.728 | 0.728 | 0.728 |       |
| 0.56  | 0.644    | 0.652 | 0.660   | 0.666 | 0.673 | 0.679 | 0.684 | 0.694 | 0.703 | 0.710 | 0.720 | 0.730 | 0.730 | 0.732 | 0.733 | 0.733 | 0.735 | 0.740 | 0.742 | 0.742 |       |
| 0.58  | 0.661    | 0.668 | 0.676   | 0.682 | 0.688 | 0.694 | 0.700 | 0.709 | 0.717 | 0.724 | 0.735 | 0.741 | 0.745 | 0.747 | 0.748 | 0.747 | 0.752 | 0.752 | 0.755 | 0.755 |       |
| 0.60  | 0.677    | 0.685 | 0.692   | 0.698 | 0.704 | 0.710 | 0.715 | 0.724 | 0.732 | 0.739 | 0.749 | 0.756 | 0.759 | 0.761 | 0.762 | 0.763 | 0.764 | 0.768 | 0.768 | 0.772 |       |

1.2.2 梁

1.2.2.1 单跨梁、双跨梁

1.悬臂梁

表 1.2.2-1

| 荷载情况  | 支座反力及剪力              | 弯矩                               | 挠度   |
|---|----------------------|----------------------------------|--|
|    | $R_B = P$            | $M_B = -Pb$                      | $f_A = \frac{Pb^2}{EJ} \left( \frac{a}{2} + \frac{b}{3} \right)$                   |
|    | $R_B = ql$           | $M_B = -\frac{ql^2}{2}$          | $f_A = \frac{ql^3}{8EJ}$   |
|    | $R_B = qb$           | $M_B = -\frac{qb^2}{2}$          | $f_A = \frac{qb^3}{2EJ} \left( \frac{a}{3} + \frac{b}{4} \right)$                  |
|   | $R_B = q(b - b')$    | $M_B = -\frac{q(b^2 - b'^2)}{2}$ | $f_A = \frac{q}{2EJ} \left( \frac{ab^3 - a'b^3}{3} + \frac{b^4 - b'^4}{4} \right)$ |
|  | $R_B = \frac{ql}{2}$ | $M_B = -\frac{ql^2}{6}$          | $f_A = \frac{ql^3}{80EJ}$  |