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| МИНОБРНАУКИ РОССИИ |
| Федеральное государственное бюджетное образовательное учреждение  высшего образования  **«МИРЭА - Российский технологический университет»**  **РТУ МИРЭА** |

Институт Информационных Технологий

Кафедра Вычислительной Техники (ВТ)

**ОТЧЁТ ПО ПРАКТИЧЕСКОЙ РАБОТЕ №** **1**

«Проектирование различных вычислительных устройств на уровне регистровых передач (RTL) для синтеза сигналов трансцендентных функций»

по дисциплине

«Схемотехника устройств компьютерных систем»

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АННОТАЦИЯ

Данная работа включает в себя 1 рисунок, 6 листингов. Количество страниц в работе — 51.

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ВВЕДЕНИЕ

Цель работы: проектирование различных вычислительных устройств на уровне регистровых передач (RTL) для синтеза сигналов трансцендентных функций.

Постановка задачи: применяя методы и алгоритмы расчёта значений трансцендентных функций, а также язык описания аппаратуры Verilog, разработать RTL-модели вычислительных устройств для синтеза сигналов трансцендентных функций.

Текущий контроль в процессе практических занятий: проверка хода выполнения студентами задания с целью выявления возможных ошибок при проектировании RTL-моделей вычислительных устройств; защита работы в формате теоретико-практического опроса.

Результат выполнения работы: код модулей на Verilog HDL, временные диаграммы, отражающие корректность работы спроектированных модулей.

1 ОСНОВНОЙ РАЗДЕЛ

* 1. Задание 1

Разработаем RTL-модель устройства на Verilog HDL для синтеза функций sin(x) и cos(x) табличным способом, произвести верификацию устройства.

Опишем модуль trig\_table, который будет вычислять значения синуса и косинуса угла, используя предварительно вычисленные и сохранённые в таблицах значения.

Для начала опишем таблицы, которые хранят предварительно вычисленные значения синуса и косинуса соответственно (Листинг 1.1, 1.2).

Листинг 1.1 – Заголовочный файл таблицы значений синусов на языке Verilog

assign sin\_table[0] = 32'b00000000000000000000000000000000;

assign sin\_table[1] = 32'b00000000110010010000111110000111;

assign sin\_table[2] = 32'b00000001100100100001110100011111;

assign sin\_table[3] = 32'b00000010010110110010011011010111;

assign sin\_table[4] = 32'b00000011001001000010101010111110;

assign sin\_table[5] = 32'b00000011111011010010011011100110;

assign sin\_table[6] = 32'b00000100101101100001100101011101;

assign sin\_table[7] = 32'b00000101011111110000000000110100;

assign sin\_table[8] = 32'b00000110010001111101100101111100;

assign sin\_table[9] = 32'b00000111000100001010001101000100;

assign sin\_table[10] = 32'b00000111110110010101101110011110;

assign sin\_table[11] = 32'b00001000101000100000000010011010;

assign sin\_table[12] = 32'b00001001011010101001000001001001;

assign sin\_table[13] = 32'b00001010001100110000100010111100;

assign sin\_table[14] = 32'b00001010111110110110100000000101;

assign sin\_table[15] = 32'b00001011110000111010110000110101;

assign sin\_table[16] = 32'b00001100100010111101001101011110;

assign sin\_table[17] = 32'b00001101010100111101101110010010;

assign sin\_table[18] = 32'b00001110000110111100001011100011;

assign sin\_table[19] = 32'b00001110111000111000011101100101;

assign sin\_table[20] = 32'b00001111101010110010011100101011;

assign sin\_table[21] = 32'b00010000011100101010000001000111;

assign sin\_table[22] = 32'b00010001001110011111000011001110;

assign sin\_table[23] = 32'b00010010000000010001011011010100;

assign sin\_table[24] = 32'b00010010110010000001000001101110;

assign sin\_table[25] = 32'b00010011100011101101101110110000;

assign sin\_table[26] = 32'b00010100010101010111011010110001;

assign sin\_table[27] = 32'b00010101000110111101111110000101;

assign sin\_table[28] = 32'b00010101111000100001010001000100;

assign sin\_table[29] = 32'b00010110101010000001001100000100;

assign sin\_table[30] = 32'b00010111011011011101100111011110;

assign sin\_table[31] = 32'b00011000001100110110011011101000;

assign sin\_table[32] = 32'b00011000111110001011100000111100;

Продолжение листинга 1.1

assign sin\_table[33] = 32'b00011001101111011100101111110010;

assign sin\_table[34] = 32'b00011010100000101010000000100101;

assign sin\_table[35] = 32'b00011011010001110011001011101111;

assign sin\_table[36] = 32'b00011100000010111000001001101010;

assign sin\_table[37] = 32'b00011100110011111000110010110011;

assign sin\_table[38] = 32'b00011101100100110100111111100101;

assign sin\_table[39] = 32'b00011110010101101100101000011110;

assign sin\_table[40] = 32'b00011111000110011111100101111011;

assign sin\_table[41] = 32'b00011111110111001101110000011010;

assign sin\_table[42] = 32'b00100000100111110111000000011100;

assign sin\_table[43] = 32'b00100001011000011011001110011111;

assign sin\_table[44] = 32'b00100010001000111010010011000101;

assign sin\_table[45] = 32'b00100010111001010100000110101110;

assign sin\_table[46] = 32'b00100011101001101000100001111110;

assign sin\_table[47] = 32'b00100100011001110111011101010111;

assign sin\_table[48] = 32'b00100101001010000000110001011101;

assign sin\_table[49] = 32'b00100101111010000100010110110101;

assign sin\_table[50] = 32'b00100110101010000010000110000101;

assign sin\_table[51] = 32'b00100111011001111001110111110100;

assign sin\_table[52] = 32'b00101000001001101011100100101000;

assign sin\_table[53] = 32'b00101000111001010111000101001010;

assign sin\_table[54] = 32'b00101001101000111100010010000100;

assign sin\_table[55] = 32'b00101010011000011011000100000001;

assign sin\_table[56] = 32'b00101011000111110011010011101011;

assign sin\_table[57] = 32'b00101011110111000100111001101111;

assign sin\_table[58] = 32'b00101100100110001111101110111010;

assign sin\_table[59] = 32'b00101101010101010011101011111011;

assign sin\_table[60] = 32'b00101110000100010000101001100001;

assign sin\_table[61] = 32'b00101110110011000110100000011110;

assign sin\_table[62] = 32'b00101111100001110101001001100010;

assign sin\_table[63] = 32'b00110000010000011100011101100000;

assign sin\_table[64] = 32'b00110000111110111100010101001101;

assign sin\_table[65] = 32'b00110001101101010100101001011101;

assign sin\_table[66] = 32'b00110010011011100101010011000111;

assign sin\_table[67] = 32'b00110011001001101110001011000010;

assign sin\_table[68] = 32'b00110011110111101111001010000111;

assign sin\_table[69] = 32'b00110100100101101000001001001111;

assign sin\_table[70] = 32'b00110101010011011001000001010110;

assign sin\_table[71] = 32'b00110110000001000001101011011000;

assign sin\_table[72] = 32'b00110110101110100010000000010011;

assign sin\_table[73] = 32'b00110111011011111001111001000110;

assign sin\_table[74] = 32'b00111000001001001001001110110000;

assign sin\_table[75] = 32'b00111000110110001111111010010011;

assign sin\_table[76] = 32'b00111001100011001101110100110010;

assign sin\_table[77] = 32'b00111010010000000010110111010001;

assign sin\_table[78] = 32'b00111010111100101110111010110111;

assign sin\_table[79] = 32'b00111011101001010001111000101001;

assign sin\_table[80] = 32'b00111100010101101011101001110000;

assign sin\_table[81] = 32'b00111101000001111100000111010101;

assign sin\_table[82] = 32'b00111101101110000011001010100101;

assign sin\_table[83] = 32'b00111110011010000000101100101100;

assign sin\_table[84] = 32'b00111111000101110100100110110111;

assign sin\_table[85] = 32'b00111111110001011110110010010111;

assign sin\_table[86] = 32'b01000000011100111111001000011101;

assign sin\_table[87] = 32'b01000001001000010101100010011010;

assign sin\_table[88] = 32'b01000001110011100001111001100100;

Продолжение листинга 1.1

assign sin\_table[89] = 32'b01000010011110100100000111010000;

assign sin\_table[90] = 32'b01000011001001011100000100110101;

assign sin\_table[91] = 32'b01000011110100001001101011101100;

assign sin\_table[92] = 32'b01000100011110101100110101010000;

assign sin\_table[93] = 32'b01000101001001000101011010111100;

assign sin\_table[94] = 32'b01000101110011010011010110001111;

assign sin\_table[95] = 32'b01000110011101010110100000100111;

assign sin\_table[96] = 32'b01000111000111001110110011100110;

assign sin\_table[97] = 32'b01000111110000111100001000101110;

assign sin\_table[98] = 32'b01001000011010011110011001100100;

assign sin\_table[99] = 32'b01001001000011110101011111101110;

assign sin\_table[100] = 32'b01001001101101000001010100110011;

assign sin\_table[101] = 32'b01001010010110000001110010011101;

assign sin\_table[102] = 32'b01001010111110110110110010010111;

assign sin\_table[103] = 32'b01001011100111100000001110001111;

assign sin\_table[104] = 32'b01001100001111111101111111110011;

assign sin\_table[105] = 32'b01001100111000010000000000110100;

assign sin\_table[106] = 32'b01001101100000010110001011000100;

assign sin\_table[107] = 32'b01001110001000010000011000010111;

assign sin\_table[108] = 32'b01001110101111111110100010100100;

assign sin\_table[109] = 32'b01001111010111100000100011100011;

assign sin\_table[110] = 32'b01001111111110110110010101001101;

assign sin\_table[111] = 32'b01010000100101111111110001011110;

assign sin\_table[112] = 32'b01010001001100111100110010010100;

assign sin\_table[113] = 32'b01010001110011101101010001101110;

assign sin\_table[114] = 32'b01010010011010010001001001101110;

assign sin\_table[115] = 32'b01010011000000101000010100010111;

assign sin\_table[116] = 32'b01010011100110110010101011101111;

assign sin\_table[117] = 32'b01010100001100110000001001111101;

assign sin\_table[118] = 32'b01010100110010100000101001001010;

assign sin\_table[119] = 32'b01010101011000000100000011100010;

assign sin\_table[120] = 32'b01010101111101011010010011010010;

assign sin\_table[121] = 32'b01010110100010100011010010101001;

assign sin\_table[122] = 32'b01010111000111011110111011111001;

assign sin\_table[123] = 32'b01010111101100001101001001010110;

assign sin\_table[124] = 32'b01011000010000101101110101010100;

assign sin\_table[125] = 32'b01011000110101000000111010001100;

assign sin\_table[126] = 32'b01011001011001000110010010010111;

assign sin\_table[127] = 32'b01011001111100111101111000010010;

assign sin\_table[128] = 32'b01011010100000100111100110011001;

assign sin\_table[129] = 32'b01011011000100000011010111001111;

assign sin\_table[130] = 32'b01011011100111010001000101010011;

assign sin\_table[131] = 32'b01011100001010010000101011001100;

assign sin\_table[132] = 32'b01011100101101000010000011011111;

assign sin\_table[133] = 32'b01011101001111100101001000110110;

assign sin\_table[134] = 32'b01011101110001111001110101111100;

assign sin\_table[135] = 32'b01011110010100000000000101011101;

assign sin\_table[136] = 32'b01011110110101110111110010001001;

assign sin\_table[137] = 32'b01011111010111100000110110110011;

assign sin\_table[138] = 32'b01011111111000111011001110001101;

assign sin\_table[139] = 32'b01100000011010000110110011001110;

assign sin\_table[140] = 32'b01100000111011000011100000101111;

assign sin\_table[141] = 32'b01100001011011110001010001101011;

assign sin\_table[142] = 32'b01100001111100010000000000111110;

assign sin\_table[143] = 32'b01100010011100011111101001101001;

assign sin\_table[144] = 32'b01100010111100100000000110101100;

Продолжение листинга 1.1

assign sin\_table[145] = 32'b01100011011100010001010011001100;

assign sin\_table[146] = 32'b01100011111011110011001010001111;

assign sin\_table[147] = 32'b01100100011011000101100110111111;

assign sin\_table[148] = 32'b01100100111010001000100100100110;

assign sin\_table[149] = 32'b01100101011000111011111110010010;

assign sin\_table[150] = 32'b01100101110111011111101111010011;

assign sin\_table[151] = 32'b01100110010101110011110010111011;

assign sin\_table[152] = 32'b01100110110011111000000100011111;

assign sin\_table[153] = 32'b01100111010001101100011111010111;

assign sin\_table[154] = 32'b01100111101111010000111110111100;

assign sin\_table[155] = 32'b01101000001100100101011110101010;

assign sin\_table[156] = 32'b01101000101001101001111010000001;

assign sin\_table[157] = 32'b01101001000110011110001100100000;

assign sin\_table[158] = 32'b01101001100011000010010001101100;

assign sin\_table[159] = 32'b01101001111111010110000101001010;

assign sin\_table[160] = 32'b01101010011011011001100010100100;

assign sin\_table[161] = 32'b01101010110111001100100101100100;

assign sin\_table[162] = 32'b01101011010010101111001001111000;

assign sin\_table[163] = 32'b01101011101110000001001011010000;

assign sin\_table[164] = 32'b01101100001001000010100101100000;

assign sin\_table[165] = 32'b01101100100011110011010100011100;

assign sin\_table[166] = 32'b01101100111110010011010011111011;

assign sin\_table[167] = 32'b01101101011000100010011111111010;

assign sin\_table[168] = 32'b01101101110010100000110100010100;

assign sin\_table[169] = 32'b01101110001100001110001101001001;

assign sin\_table[170] = 32'b01101110100101101010100110011100;

assign sin\_table[171] = 32'b01101110111110110101111100010010;

assign sin\_table[172] = 32'b01101111010111110000001010110001;

assign sin\_table[173] = 32'b01101111110000011001001110000101;

assign sin\_table[174] = 32'b01110000001000110001000010011001;

assign sin\_table[175] = 32'b01110000100000110111100011111110;

assign sin\_table[176] = 32'b01110000111000101100101111000110;

assign sin\_table[177] = 32'b01110001010000010000100000000100;

assign sin\_table[178] = 32'b01110001100111100010110011010010;

assign sin\_table[179] = 32'b01110001111110100011100101001000;

assign sin\_table[180] = 32'b01110010010101010010110010000100;

assign sin\_table[181] = 32'b01110010101011110000010110100110;

assign sin\_table[182] = 32'b01110011000001111100001111001111;

assign sin\_table[183] = 32'b01110011010111110110011000100110;

assign sin\_table[184] = 32'b01110011101101011110101111010000;

assign sin\_table[185] = 32'b01110100000010110101001111111010;

assign sin\_table[186] = 32'b01110100010111111001110111010000;

assign sin\_table[187] = 32'b01110100101100101100100010000011;

assign sin\_table[188] = 32'b01110101000001001101001101000101;

assign sin\_table[189] = 32'b01110101010101011011110101001011;

assign sin\_table[190] = 32'b01110101101001011000010111001111;

assign sin\_table[191] = 32'b01110101111101000010110000001010;

assign sin\_table[192] = 32'b01110110010000011010111100111100;

assign sin\_table[193] = 32'b01110110100011100000111010100101;

assign sin\_table[194] = 32'b01110110110110010100100110001000;

assign sin\_table[195] = 32'b01110111001000110101111100101101;

assign sin\_table[196] = 32'b01110111011011000100111011011011;

assign sin\_table[197] = 32'b01110111101101000001011111011111;

assign sin\_table[198] = 32'b01110111111110101011100110001000;

assign sin\_table[199] = 32'b01111000010000000011001100101000;

assign sin\_table[200] = 32'b01111000100001001000010000010011;

Продолжение листинга 1.1

assign sin\_table[201] = 32'b01111000110001111010101110100001;

assign sin\_table[202] = 32'b01111001000010011010100100101100;

assign sin\_table[203] = 32'b01111001010010100111110000010001;

assign sin\_table[204] = 32'b01111001100010100010001110110001;

assign sin\_table[205] = 32'b01111001110010001001111101101101;

assign sin\_table[206] = 32'b01111010000001011110111010101101;

assign sin\_table[207] = 32'b01111010010000100001000011011000;

assign sin\_table[208] = 32'b01111010011111010000010101011011;

assign sin\_table[209] = 32'b01111010101101101100101110100011;

assign sin\_table[210] = 32'b01111010111011110110001100100011;

assign sin\_table[211] = 32'b01111011001001101100101101001111;

assign sin\_table[212] = 32'b01111011010111010000001110011101;

assign sin\_table[213] = 32'b01111011100100100000101110001001;

assign sin\_table[214] = 32'b01111011110001011110001010001111;

assign sin\_table[215] = 32'b01111011111110001000100000110000;

assign sin\_table[216] = 32'b01111100001010011111101111101110;

assign sin\_table[217] = 32'b01111100010110100011110101001111;

assign sin\_table[218] = 32'b01111100100010010100101111011101;

assign sin\_table[219] = 32'b01111100101101110010011100100100;

assign sin\_table[220] = 32'b01111100111000111100111010110001;

assign sin\_table[221] = 32'b01111101000011110100001000010111;

assign sin\_table[222] = 32'b01111101001110011000000011101100;

assign sin\_table[223] = 32'b01111101011000101000101011000101;

assign sin\_table[224] = 32'b01111101100010100101111100111111;

assign sin\_table[225] = 32'b01111101101100001111110111110111;

assign sin\_table[226] = 32'b01111101110101100110011010001110;

assign sin\_table[227] = 32'b01111101111110101001100010100111;

assign sin\_table[228] = 32'b01111110000111011001001111101001;

assign sin\_table[229] = 32'b01111110001111110101011111111110;

assign sin\_table[230] = 32'b01111110010111111110010010010011;

assign sin\_table[231] = 32'b01111110011111110011100101010110;

assign sin\_table[232] = 32'b01111110100111010101010111111100;

assign sin\_table[233] = 32'b01111110101110100011101000111001;

assign sin\_table[234] = 32'b01111110110101011110010111000110;

assign sin\_table[235] = 32'b01111110111100000101100001011111;

assign sin\_table[236] = 32'b01111111000010011001000111000011;

assign sin\_table[237] = 32'b01111111001000011001000110110011;

assign sin\_table[238] = 32'b01111111001110000101011111110101;

assign sin\_table[239] = 32'b01111111010011011110010001010000;

assign sin\_table[240] = 32'b01111111011000100011011010001111;

assign sin\_table[241] = 32'b01111111011101010100111001111111;

assign sin\_table[242] = 32'b01111111100001110010101111110010;

assign sin\_table[243] = 32'b01111111100101111100111010111100;

assign sin\_table[244] = 32'b01111111101001110011011010110100;

assign sin\_table[245] = 32'b01111111101101010110001110110010;

assign sin\_table[246] = 32'b01111111110000100101010110010110;

assign sin\_table[247] = 32'b01111111110011100000110000111110;

assign sin\_table[248] = 32'b01111111110110001000011110001101;

assign sin\_table[249] = 32'b01111111111000011100011101101011;

assign sin\_table[250] = 32'b01111111111010011100101110111111;

assign sin\_table[251] = 32'b01111111111100001001010001110111;

assign sin\_table[252] = 32'b01111111111101100010000110000010;

assign sin\_table[253] = 32'b01111111111110100111001011010001;

assign sin\_table[254] = 32'b01111111111111011000100001011010;

assign sin\_table[255] = 32'b01111111111111110110001000010110;

assign sin\_table[256] = 32'b10000000000000000000000000000000;

Продолжение листинга 1.1

assign sin\_table[257] = 32'b01111111111111110110001000010110;

assign sin\_table[258] = 32'b01111111111111011000100001011010;

assign sin\_table[259] = 32'b01111111111110100111001011010001;

assign sin\_table[260] = 32'b01111111111101100010000110000010;

assign sin\_table[261] = 32'b01111111111100001001010001110111;

assign sin\_table[262] = 32'b01111111111010011100101110111111;

assign sin\_table[263] = 32'b01111111111000011100011101101011;

assign sin\_table[264] = 32'b01111111110110001000011110001101;

assign sin\_table[265] = 32'b01111111110011100000110000111110;

assign sin\_table[266] = 32'b01111111110000100101010110010110;

assign sin\_table[267] = 32'b01111111101101010110001110110010;

assign sin\_table[268] = 32'b01111111101001110011011010110100;

assign sin\_table[269] = 32'b01111111100101111100111010111100;

assign sin\_table[270] = 32'b01111111100001110010101111110010;

assign sin\_table[271] = 32'b01111111011101010100111001111111;

assign sin\_table[272] = 32'b01111111011000100011011010001111;

assign sin\_table[273] = 32'b01111111010011011110010001010000;

assign sin\_table[274] = 32'b01111111001110000101011111110101;

assign sin\_table[275] = 32'b01111111001000011001000110110011;

assign sin\_table[276] = 32'b01111111000010011001000111000011;

assign sin\_table[277] = 32'b01111110111100000101100001011111;

assign sin\_table[278] = 32'b01111110110101011110010111000110;

assign sin\_table[279] = 32'b01111110101110100011101000111001;

assign sin\_table[280] = 32'b01111110100111010101010111111100;

assign sin\_table[281] = 32'b01111110011111110011100101010110;

assign sin\_table[282] = 32'b01111110010111111110010010010011;

assign sin\_table[283] = 32'b01111110001111110101011111111110;

assign sin\_table[284] = 32'b01111110000111011001001111101001;

assign sin\_table[285] = 32'b01111101111110101001100010100111;

assign sin\_table[286] = 32'b01111101110101100110011010001110;

assign sin\_table[287] = 32'b01111101101100001111110111110111;

assign sin\_table[288] = 32'b01111101100010100101111100111111;

assign sin\_table[289] = 32'b01111101011000101000101011000101;

assign sin\_table[290] = 32'b01111101001110011000000011101100;

assign sin\_table[291] = 32'b01111101000011110100001000010111;

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assign sin\_table[293] = 32'b01111100101101110010011100100100;

assign sin\_table[294] = 32'b01111100100010010100101111011101;

assign sin\_table[295] = 32'b01111100010110100011110101001111;

assign sin\_table[296] = 32'b01111100001010011111101111101110;

assign sin\_table[297] = 32'b01111011111110001000100000110000;

assign sin\_table[298] = 32'b01111011110001011110001010001111;

assign sin\_table[299] = 32'b01111011100100100000101110001001;

assign sin\_table[300] = 32'b01111011010111010000001110011101;

assign sin\_table[301] = 32'b01111011001001101100101101001111;

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assign sin\_table[303] = 32'b01111010101101101100101110100011;

assign sin\_table[304] = 32'b01111010011111010000010101011011;

assign sin\_table[305] = 32'b01111010010000100001000011011000;

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assign sin\_table[308] = 32'b01111001100010100010001110110001;

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assign sin\_table[311] = 32'b01111000110001111010101110100001;

assign sin\_table[312] = 32'b01111000100001001000010000010011;

Продолжение листинга 1.1

assign sin\_table[313] = 32'b01111000010000000011001100101000;

assign sin\_table[314] = 32'b01110111111110101011100110001000;

assign sin\_table[315] = 32'b01110111101101000001011111011111;

assign sin\_table[316] = 32'b01110111011011000100111011011011;

assign sin\_table[317] = 32'b01110111001000110101111100101101;

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assign sin\_table[319] = 32'b01110110100011100000111010100101;

assign sin\_table[320] = 32'b01110110010000011010111100111100;

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assign sin\_table[331] = 32'b01110010101011110000010110100110;

assign sin\_table[332] = 32'b01110010010101010010110010000100;

assign sin\_table[333] = 32'b01110001111110100011100101001000;

assign sin\_table[334] = 32'b01110001100111100010110011010010;

assign sin\_table[335] = 32'b01110001010000010000100000000100;

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assign sin\_table[337] = 32'b01110000100000110111100011111110;

assign sin\_table[338] = 32'b01110000001000110001000010011001;

assign sin\_table[339] = 32'b01101111110000011001001110000101;

assign sin\_table[340] = 32'b01101111010111110000001010110001;

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assign sin\_table[342] = 32'b01101110100101101010100110011100;

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assign sin\_table[350] = 32'b01101011010010101111001001111000;

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assign sin\_table[352] = 32'b01101010011011011001100010100100;

assign sin\_table[353] = 32'b01101001111111010110000101001010;

assign sin\_table[354] = 32'b01101001100011000010010001101100;

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assign sin\_table[361] = 32'b01100110010101110011110010111011;

assign sin\_table[362] = 32'b01100101110111011111101111010011;

assign sin\_table[363] = 32'b01100101011000111011111110010010;

assign sin\_table[364] = 32'b01100100111010001000100100100110;

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assign sin\_table[367] = 32'b01100011011100010001010011001100;

assign sin\_table[368] = 32'b01100010111100100000000110101100;

Продолжение листинга 1.1

assign sin\_table[369] = 32'b01100010011100011111101001101001;

assign sin\_table[370] = 32'b01100001111100010000000000111110;

assign sin\_table[371] = 32'b01100001011011110001010001101011;

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assign sin\_table[373] = 32'b01100000011010000110110011001110;

assign sin\_table[374] = 32'b01011111111000111011001110001101;

assign sin\_table[375] = 32'b01011111010111100000110110110011;

assign sin\_table[376] = 32'b01011110110101110111110010001001;

assign sin\_table[377] = 32'b01011110010100000000000101011101;

assign sin\_table[378] = 32'b01011101110001111001110101111100;

assign sin\_table[379] = 32'b01011101001111100101001000110110;

assign sin\_table[380] = 32'b01011100101101000010000011011111;

assign sin\_table[381] = 32'b01011100001010010000101011001100;

assign sin\_table[382] = 32'b01011011100111010001000101010011;

assign sin\_table[383] = 32'b01011011000100000011010111001111;

assign sin\_table[384] = 32'b01011010100000100111100110011001;

assign sin\_table[385] = 32'b01011001111100111101111000010010;

assign sin\_table[386] = 32'b01011001011001000110010010010111;

assign sin\_table[387] = 32'b01011000110101000000111010001100;

assign sin\_table[388] = 32'b01011000010000101101110101010100;

assign sin\_table[389] = 32'b01010111101100001101001001010110;

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assign sin\_table[391] = 32'b01010110100010100011010010101001;

assign sin\_table[392] = 32'b01010101111101011010010011010010;

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assign sin\_table[394] = 32'b01010100110010100000101001001010;

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assign sin\_table[405] = 32'b01001110001000010000011000010111;

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assign sin\_table[408] = 32'b01001100001111111101111111110011;

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assign sin\_table[410] = 32'b01001010111110110110110010010111;

assign sin\_table[411] = 32'b01001010010110000001110010011101;

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assign sin\_table[413] = 32'b01001001000011110101011111101110;

assign sin\_table[414] = 32'b01001000011010011110011001100100;

assign sin\_table[415] = 32'b01000111110000111100001000101110;

assign sin\_table[416] = 32'b01000111000111001110110011100110;

assign sin\_table[417] = 32'b01000110011101010110100000100111;

assign sin\_table[418] = 32'b01000101110011010011010110001111;

assign sin\_table[419] = 32'b01000101001001000101011010111100;

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assign sin\_table[423] = 32'b01000010011110100100000111010000;

assign sin\_table[424] = 32'b01000001110011100001111001100100;

Продолжение листинга 1.1

assign sin\_table[425] = 32'b01000001001000010101100010011010;

assign sin\_table[426] = 32'b01000000011100111111001000011101;

assign sin\_table[427] = 32'b00111111110001011110110010010111;

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assign sin\_table[429] = 32'b00111110011010000000101100101100;

assign sin\_table[430] = 32'b00111101101110000011001010100101;

assign sin\_table[431] = 32'b00111101000001111100000111010101;

assign sin\_table[432] = 32'b00111100010101101011101001110000;

assign sin\_table[433] = 32'b00111011101001010001111000101001;

assign sin\_table[434] = 32'b00111010111100101110111010110111;

assign sin\_table[435] = 32'b00111010010000000010110111010001;

assign sin\_table[436] = 32'b00111001100011001101110100110010;

assign sin\_table[437] = 32'b00111000110110001111111010010011;

assign sin\_table[438] = 32'b00111000001001001001001110110000;

assign sin\_table[439] = 32'b00110111011011111001111001000110;

assign sin\_table[440] = 32'b00110110101110100010000000010011;

assign sin\_table[441] = 32'b00110110000001000001101011011000;

assign sin\_table[442] = 32'b00110101010011011001000001010110;

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assign sin\_table[444] = 32'b00110011110111101111001010000111;

assign sin\_table[445] = 32'b00110011001001101110001011000010;

assign sin\_table[446] = 32'b00110010011011100101010011000111;

assign sin\_table[447] = 32'b00110001101101010100101001011101;

assign sin\_table[448] = 32'b00110000111110111100010101001101;

assign sin\_table[449] = 32'b00110000010000011100011101100000;

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assign sin\_table[453] = 32'b00101101010101010011101011111011;

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assign sin\_table[463] = 32'b00100101111010000100010110110101;

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assign sin\_table[479] = 32'b00011001101111011100101111110010;

assign sin\_table[480] = 32'b00011000111110001011100000111100;

Продолжение листинга 1.1

assign sin\_table[481] = 32'b00011000001100110110011011101000;

assign sin\_table[482] = 32'b00010111011011011101100111011110;

assign sin\_table[483] = 32'b00010110101010000001001100000100;

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assign sin\_table[485] = 32'b00010101000110111101111110000101;

assign sin\_table[486] = 32'b00010100010101010111011010110001;

assign sin\_table[487] = 32'b00010011100011101101101110110000;

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assign sin\_table[493] = 32'b00001110111000111000011101100101;

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assign sin\_table[499] = 32'b00001010001100110000100010111100;

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assign sin\_table[518] = 32'b00000100101101100001100101011101;

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assign sin\_table[524] = 32'b00001001011010101001000001001001;

assign sin\_table[525] = 32'b00001010001100110000100010111100;

assign sin\_table[526] = 32'b00001010111110110110100000000101;

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assign sin\_table[529] = 32'b00001101010100111101101110010010;

assign sin\_table[530] = 32'b00001110000110111100001011100011;

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assign sin\_table[532] = 32'b00001111101010110010011100101011;

assign sin\_table[533] = 32'b00010000011100101010000001000111;

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assign sin\_table[535] = 32'b00010010000000010001011011010100;

assign sin\_table[536] = 32'b00010010110010000001000001101110;

Продолжение листинга 1.1

assign sin\_table[537] = 32'b00010011100011101101101110110000;

assign sin\_table[538] = 32'b00010100010101010111011010110001;

assign sin\_table[539] = 32'b00010101000110111101111110000101;

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assign sin\_table[541] = 32'b00010110101010000001001100000100;

assign sin\_table[542] = 32'b00010111011011011101100111011110;

assign sin\_table[543] = 32'b00011000001100110110011011101000;

assign sin\_table[544] = 32'b00011000111110001011100000111100;

assign sin\_table[545] = 32'b00011001101111011100101111110010;

assign sin\_table[546] = 32'b00011010100000101010000000100101;

assign sin\_table[547] = 32'b00011011010001110011001011101111;

assign sin\_table[548] = 32'b00011100000010111000001001101010;

assign sin\_table[549] = 32'b00011100110011111000110010110011;

assign sin\_table[550] = 32'b00011101100100110100111111100101;

assign sin\_table[551] = 32'b00011110010101101100101000011110;

assign sin\_table[552] = 32'b00011111000110011111100101111011;

assign sin\_table[553] = 32'b00011111110111001101110000011010;

assign sin\_table[554] = 32'b00100000100111110111000000011100;

assign sin\_table[555] = 32'b00100001011000011011001110011111;

assign sin\_table[556] = 32'b00100010001000111010010011000101;

assign sin\_table[557] = 32'b00100010111001010100000110101110;

assign sin\_table[558] = 32'b00100011101001101000100001111110;

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assign sin\_table[561] = 32'b00100101111010000100010110110101;

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assign sin\_table[576] = 32'b00110000111110111100010101001101;

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assign sin\_table[579] = 32'b00110011001001101110001011000010;

assign sin\_table[580] = 32'b00110011110111101111001010000111;

assign sin\_table[581] = 32'b00110100100101101000001001001111;

assign sin\_table[582] = 32'b00110101010011011001000001010110;

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assign sin\_table[584] = 32'b00110110101110100010000000010011;

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assign sin\_table[589] = 32'b00111010010000000010110111010001;

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assign sin\_table[591] = 32'b00111011101001010001111000101001;

assign sin\_table[592] = 32'b00111100010101101011101001110000;

Продолжение листинга 1.1

assign sin\_table[593] = 32'b00111101000001111100000111010101;

assign sin\_table[594] = 32'b00111101101110000011001010100101;

assign sin\_table[595] = 32'b00111110011010000000101100101100;

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assign sin\_table[601] = 32'b01000010011110100100000111010000;

assign sin\_table[602] = 32'b01000011001001011100000100110101;

assign sin\_table[603] = 32'b01000011110100001001101011101100;

assign sin\_table[604] = 32'b01000100011110101100110101010000;

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assign sin\_table[611] = 32'b01001001000011110101011111101110;

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assign sin\_table[617] = 32'b01001100111000010000000000110100;

assign sin\_table[618] = 32'b01001101100000010110001011000100;

assign sin\_table[619] = 32'b01001110001000010000011000010111;

assign sin\_table[620] = 32'b01001110101111111110100010100100;

assign sin\_table[621] = 32'b01001111010111100000100011100011;

assign sin\_table[622] = 32'b01001111111110110110010101001101;

assign sin\_table[623] = 32'b01010000100101111111110001011110;

assign sin\_table[624] = 32'b01010001001100111100110010010100;

assign sin\_table[625] = 32'b01010001110011101101010001101110;

assign sin\_table[626] = 32'b01010010011010010001001001101110;

assign sin\_table[627] = 32'b01010011000000101000010100010111;

assign sin\_table[628] = 32'b01010011100110110010101011101111;

assign sin\_table[629] = 32'b01010100001100110000001001111101;

assign sin\_table[630] = 32'b01010100110010100000101001001010;

assign sin\_table[631] = 32'b01010101011000000100000011100010;

assign sin\_table[632] = 32'b01010101111101011010010011010010;

assign sin\_table[633] = 32'b01010110100010100011010010101001;

assign sin\_table[634] = 32'b01010111000111011110111011111001;

assign sin\_table[635] = 32'b01010111101100001101001001010110;

assign sin\_table[636] = 32'b01011000010000101101110101010100;

assign sin\_table[637] = 32'b01011000110101000000111010001100;

assign sin\_table[638] = 32'b01011001011001000110010010010111;

assign sin\_table[639] = 32'b01011001111100111101111000010010;

assign sin\_table[640] = 32'b01011010100000100111100110011001;

assign sin\_table[641] = 32'b01011011000100000011010111001111;

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assign sin\_table[643] = 32'b01011100001010010000101011001100;

assign sin\_table[644] = 32'b01011100101101000010000011011111;

assign sin\_table[645] = 32'b01011101001111100101001000110110;

assign sin\_table[646] = 32'b01011101110001111001110101111100;

assign sin\_table[647] = 32'b01011110010100000000000101011101;

assign sin\_table[648] = 32'b01011110110101110111110010001001;

Продолжение листинга 1.1

assign sin\_table[649] = 32'b01011111010111100000110110110011;

assign sin\_table[650] = 32'b01011111111000111011001110001101;

assign sin\_table[651] = 32'b01100000011010000110110011001110;

assign sin\_table[652] = 32'b01100000111011000011100000101111;

assign sin\_table[653] = 32'b01100001011011110001010001101011;

assign sin\_table[654] = 32'b01100001111100010000000000111110;

assign sin\_table[655] = 32'b01100010011100011111101001101001;

assign sin\_table[656] = 32'b01100010111100100000000110101100;

assign sin\_table[657] = 32'b01100011011100010001010011001100;

assign sin\_table[658] = 32'b01100011111011110011001010001111;

assign sin\_table[659] = 32'b01100100011011000101100110111111;

assign sin\_table[660] = 32'b01100100111010001000100100100110;

assign sin\_table[661] = 32'b01100101011000111011111110010010;

assign sin\_table[662] = 32'b01100101110111011111101111010011;

assign sin\_table[663] = 32'b01100110010101110011110010111011;

assign sin\_table[664] = 32'b01100110110011111000000100011111;

assign sin\_table[665] = 32'b01100111010001101100011111010111;

assign sin\_table[666] = 32'b01100111101111010000111110111100;

assign sin\_table[667] = 32'b01101000001100100101011110101010;

assign sin\_table[668] = 32'b01101000101001101001111010000001;

assign sin\_table[669] = 32'b01101001000110011110001100100000;

assign sin\_table[670] = 32'b01101001100011000010010001101100;

assign sin\_table[671] = 32'b01101001111111010110000101001010;

assign sin\_table[672] = 32'b01101010011011011001100010100100;

assign sin\_table[673] = 32'b01101010110111001100100101100100;

assign sin\_table[674] = 32'b01101011010010101111001001111000;

assign sin\_table[675] = 32'b01101011101110000001001011010000;

assign sin\_table[676] = 32'b01101100001001000010100101100000;

assign sin\_table[677] = 32'b01101100100011110011010100011100;

assign sin\_table[678] = 32'b01101100111110010011010011111011;

assign sin\_table[679] = 32'b01101101011000100010011111111010;

assign sin\_table[680] = 32'b01101101110010100000110100010100;

assign sin\_table[681] = 32'b01101110001100001110001101001001;

assign sin\_table[682] = 32'b01101110100101101010100110011100;

assign sin\_table[683] = 32'b01101110111110110101111100010010;

assign sin\_table[684] = 32'b01101111010111110000001010110001;

assign sin\_table[685] = 32'b01101111110000011001001110000101;

assign sin\_table[686] = 32'b01110000001000110001000010011001;

assign sin\_table[687] = 32'b01110000100000110111100011111110;

assign sin\_table[688] = 32'b01110000111000101100101111000110;

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assign sin\_table[690] = 32'b01110001100111100010110011010010;

assign sin\_table[691] = 32'b01110001111110100011100101001000;

assign sin\_table[692] = 32'b01110010010101010010110010000100;

assign sin\_table[693] = 32'b01110010101011110000010110100110;

assign sin\_table[694] = 32'b01110011000001111100001111001111;

assign sin\_table[695] = 32'b01110011010111110110011000100110;

assign sin\_table[696] = 32'b01110011101101011110101111010000;

assign sin\_table[697] = 32'b01110100000010110101001111111010;

assign sin\_table[698] = 32'b01110100010111111001110111010000;

assign sin\_table[699] = 32'b01110100101100101100100010000011;

assign sin\_table[700] = 32'b01110101000001001101001101000101;

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assign sin\_table[703] = 32'b01110101111101000010110000001010;

assign sin\_table[704] = 32'b01110110010000011010111100111100;

Продолжение листинга 1.1

assign sin\_table[705] = 32'b01110110100011100000111010100101;

assign sin\_table[706] = 32'b01110110110110010100100110001000;

assign sin\_table[707] = 32'b01110111001000110101111100101101;

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assign sin\_table[709] = 32'b01110111101101000001011111011111;

assign sin\_table[710] = 32'b01110111111110101011100110001000;

assign sin\_table[711] = 32'b01111000010000000011001100101000;

assign sin\_table[712] = 32'b01111000100001001000010000010011;

assign sin\_table[713] = 32'b01111000110001111010101110100001;

assign sin\_table[714] = 32'b01111001000010011010100100101100;

assign sin\_table[715] = 32'b01111001010010100111110000010001;

assign sin\_table[716] = 32'b01111001100010100010001110110001;

assign sin\_table[717] = 32'b01111001110010001001111101101101;

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assign sin\_table[719] = 32'b01111010010000100001000011011000;

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assign sin\_table[721] = 32'b01111010101101101100101110100011;

assign sin\_table[722] = 32'b01111010111011110110001100100011;

assign sin\_table[723] = 32'b01111011001001101100101101001111;

assign sin\_table[724] = 32'b01111011010111010000001110011101;

assign sin\_table[725] = 32'b01111011100100100000101110001001;

assign sin\_table[726] = 32'b01111011110001011110001010001111;

assign sin\_table[727] = 32'b01111011111110001000100000110000;

assign sin\_table[728] = 32'b01111100001010011111101111101110;

assign sin\_table[729] = 32'b01111100010110100011110101001111;

assign sin\_table[730] = 32'b01111100100010010100101111011101;

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assign sin\_table[732] = 32'b01111100111000111100111010110001;

assign sin\_table[733] = 32'b01111101000011110100001000010111;

assign sin\_table[734] = 32'b01111101001110011000000011101100;

assign sin\_table[735] = 32'b01111101011000101000101011000101;

assign sin\_table[736] = 32'b01111101100010100101111100111111;

assign sin\_table[737] = 32'b01111101101100001111110111110111;

assign sin\_table[738] = 32'b01111101110101100110011010001110;

assign sin\_table[739] = 32'b01111101111110101001100010100111;

assign sin\_table[740] = 32'b01111110000111011001001111101001;

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assign sin\_table[743] = 32'b01111110011111110011100101010110;

assign sin\_table[744] = 32'b01111110100111010101010111111100;

assign sin\_table[745] = 32'b01111110101110100011101000111001;

assign sin\_table[746] = 32'b01111110110101011110010111000110;

assign sin\_table[747] = 32'b01111110111100000101100001011111;

assign sin\_table[748] = 32'b01111111000010011001000111000011;

assign sin\_table[749] = 32'b01111111001000011001000110110011;

assign sin\_table[750] = 32'b01111111001110000101011111110101;

assign sin\_table[751] = 32'b01111111010011011110010001010000;

assign sin\_table[752] = 32'b01111111011000100011011010001111;

assign sin\_table[753] = 32'b01111111011101010100111001111111;

assign sin\_table[754] = 32'b01111111100001110010101111110010;

assign sin\_table[755] = 32'b01111111100101111100111010111100;

assign sin\_table[756] = 32'b01111111101001110011011010110100;

assign sin\_table[757] = 32'b01111111101101010110001110110010;

assign sin\_table[758] = 32'b01111111110000100101010110010110;

assign sin\_table[759] = 32'b01111111110011100000110000111110;

assign sin\_table[760] = 32'b01111111110110001000011110001101;

Продолжение листинга 1.1

assign sin\_table[761] = 32'b01111111111000011100011101101011;

assign sin\_table[762] = 32'b01111111111010011100101110111111;

assign sin\_table[763] = 32'b01111111111100001001010001110111;

assign sin\_table[764] = 32'b01111111111101100010000110000010;

assign sin\_table[765] = 32'b01111111111110100111001011010001;

assign sin\_table[766] = 32'b01111111111111011000100001011010;

assign sin\_table[767] = 32'b01111111111111110110001000010110;

assign sin\_table[768] = 32'b10000000000000000000000000000000;

assign sin\_table[769] = 32'b01111111111111110110001000010110;

assign sin\_table[770] = 32'b01111111111111011000100001011010;

assign sin\_table[771] = 32'b01111111111110100111001011010001;

assign sin\_table[772] = 32'b01111111111101100010000110000010;

assign sin\_table[773] = 32'b01111111111100001001010001110111;

assign sin\_table[774] = 32'b01111111111010011100101110111111;

assign sin\_table[775] = 32'b01111111111000011100011101101011;

assign sin\_table[776] = 32'b01111111110110001000011110001101;

assign sin\_table[777] = 32'b01111111110011100000110000111110;

assign sin\_table[778] = 32'b01111111110000100101010110010110;

assign sin\_table[779] = 32'b01111111101101010110001110110010;

assign sin\_table[780] = 32'b01111111101001110011011010110100;

assign sin\_table[781] = 32'b01111111100101111100111010111100;

assign sin\_table[782] = 32'b01111111100001110010101111110010;

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assign sin\_table[786] = 32'b01111111001110000101011111110101;

assign sin\_table[787] = 32'b01111111001000011001000110110011;

assign sin\_table[788] = 32'b01111111000010011001000111000011;

assign sin\_table[789] = 32'b01111110111100000101100001011111;

assign sin\_table[790] = 32'b01111110110101011110010111000110;

assign sin\_table[791] = 32'b01111110101110100011101000111001;

assign sin\_table[792] = 32'b01111110100111010101010111111100;

assign sin\_table[793] = 32'b01111110011111110011100101010110;

assign sin\_table[794] = 32'b01111110010111111110010010010011;

assign sin\_table[795] = 32'b01111110001111110101011111111110;

assign sin\_table[796] = 32'b01111110000111011001001111101001;

assign sin\_table[797] = 32'b01111101111110101001100010100111;

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assign sin\_table[808] = 32'b01111100001010011111101111101110;

assign sin\_table[809] = 32'b01111011111110001000100000110000;

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assign sin\_table[812] = 32'b01111011010111010000001110011101;

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assign sin\_table[815] = 32'b01111010101101101100101110100011;

assign sin\_table[816] = 32'b01111010011111010000010101011011;

Продолжение листинга 1.1

assign sin\_table[817] = 32'b01111010010000100001000011011000;

assign sin\_table[818] = 32'b01111010000001011110111010101101;

assign sin\_table[819] = 32'b01111001110010001001111101101101;

assign sin\_table[820] = 32'b01111001100010100010001110110001;

assign sin\_table[821] = 32'b01111001010010100111110000010001;

assign sin\_table[822] = 32'b01111001000010011010100100101100;

assign sin\_table[823] = 32'b01111000110001111010101110100001;

assign sin\_table[824] = 32'b01111000100001001000010000010011;

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assign sin\_table[826] = 32'b01110111111110101011100110001000;

assign sin\_table[827] = 32'b01110111101101000001011111011111;

assign sin\_table[828] = 32'b01110111011011000100111011011011;

assign sin\_table[829] = 32'b01110111001000110101111100101101;

assign sin\_table[830] = 32'b01110110110110010100100110001000;

assign sin\_table[831] = 32'b01110110100011100000111010100101;

assign sin\_table[832] = 32'b01110110010000011010111100111100;

assign sin\_table[833] = 32'b01110101111101000010110000001010;

assign sin\_table[834] = 32'b01110101101001011000010111001111;

assign sin\_table[835] = 32'b01110101010101011011110101001011;

assign sin\_table[836] = 32'b01110101000001001101001101000101;

assign sin\_table[837] = 32'b01110100101100101100100010000011;

assign sin\_table[838] = 32'b01110100010111111001110111010000;

assign sin\_table[839] = 32'b01110100000010110101001111111010;

assign sin\_table[840] = 32'b01110011101101011110101111010000;

assign sin\_table[841] = 32'b01110011010111110110011000100110;

assign sin\_table[842] = 32'b01110011000001111100001111001111;

assign sin\_table[843] = 32'b01110010101011110000010110100110;

assign sin\_table[844] = 32'b01110010010101010010110010000100;

assign sin\_table[845] = 32'b01110001111110100011100101001000;

assign sin\_table[846] = 32'b01110001100111100010110011010010;

assign sin\_table[847] = 32'b01110001010000010000100000000100;

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assign sin\_table[849] = 32'b01110000100000110111100011111110;

assign sin\_table[850] = 32'b01110000001000110001000010011001;

assign sin\_table[851] = 32'b01101111110000011001001110000101;

assign sin\_table[852] = 32'b01101111010111110000001010110001;

assign sin\_table[853] = 32'b01101110111110110101111100010010;

assign sin\_table[854] = 32'b01101110100101101010100110011100;

assign sin\_table[855] = 32'b01101110001100001110001101001001;

assign sin\_table[856] = 32'b01101101110010100000110100010100;

assign sin\_table[857] = 32'b01101101011000100010011111111010;

assign sin\_table[858] = 32'b01101100111110010011010011111011;

assign sin\_table[859] = 32'b01101100100011110011010100011100;

assign sin\_table[860] = 32'b01101100001001000010100101100000;

assign sin\_table[861] = 32'b01101011101110000001001011010000;

assign sin\_table[862] = 32'b01101011010010101111001001111000;

assign sin\_table[863] = 32'b01101010110111001100100101100100;

assign sin\_table[864] = 32'b01101010011011011001100010100100;

assign sin\_table[865] = 32'b01101001111111010110000101001010;

assign sin\_table[866] = 32'b01101001100011000010010001101100;

assign sin\_table[867] = 32'b01101001000110011110001100100000;

assign sin\_table[868] = 32'b01101000101001101001111010000001;

assign sin\_table[869] = 32'b01101000001100100101011110101010;

assign sin\_table[870] = 32'b01100111101111010000111110111100;

assign sin\_table[871] = 32'b01100111010001101100011111010111;

assign sin\_table[872] = 32'b01100110110011111000000100011111;

Продолжение листинга 1.1

assign sin\_table[873] = 32'b01100110010101110011110010111011;

assign sin\_table[874] = 32'b01100101110111011111101111010011;

assign sin\_table[875] = 32'b01100101011000111011111110010010;

assign sin\_table[876] = 32'b01100100111010001000100100100110;

assign sin\_table[877] = 32'b01100100011011000101100110111111;

assign sin\_table[878] = 32'b01100011111011110011001010001111;

assign sin\_table[879] = 32'b01100011011100010001010011001100;

assign sin\_table[880] = 32'b01100010111100100000000110101100;

assign sin\_table[881] = 32'b01100010011100011111101001101001;

assign sin\_table[882] = 32'b01100001111100010000000000111110;

assign sin\_table[883] = 32'b01100001011011110001010001101011;

assign sin\_table[884] = 32'b01100000111011000011100000101111;

assign sin\_table[885] = 32'b01100000011010000110110011001110;

assign sin\_table[886] = 32'b01011111111000111011001110001101;

assign sin\_table[887] = 32'b01011111010111100000110110110011;

assign sin\_table[888] = 32'b01011110110101110111110010001001;

assign sin\_table[889] = 32'b01011110010100000000000101011101;

assign sin\_table[890] = 32'b01011101110001111001110101111100;

assign sin\_table[891] = 32'b01011101001111100101001000110110;

assign sin\_table[892] = 32'b01011100101101000010000011011111;

assign sin\_table[893] = 32'b01011100001010010000101011001100;

assign sin\_table[894] = 32'b01011011100111010001000101010011;

assign sin\_table[895] = 32'b01011011000100000011010111001111;

assign sin\_table[896] = 32'b01011010100000100111100110011001;

assign sin\_table[897] = 32'b01011001111100111101111000010010;

assign sin\_table[898] = 32'b01011001011001000110010010010111;

assign sin\_table[899] = 32'b01011000110101000000111010001100;

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assign sin\_table[901] = 32'b01010111101100001101001001010110;

assign sin\_table[902] = 32'b01010111000111011110111011111001;

assign sin\_table[903] = 32'b01010110100010100011010010101001;

assign sin\_table[904] = 32'b01010101111101011010010011010010;

assign sin\_table[905] = 32'b01010101011000000100000011100010;

assign sin\_table[906] = 32'b01010100110010100000101001001010;

assign sin\_table[907] = 32'b01010100001100110000001001111101;

assign sin\_table[908] = 32'b01010011100110110010101011101111;

assign sin\_table[909] = 32'b01010011000000101000010100010111;

assign sin\_table[910] = 32'b01010010011010010001001001101110;

assign sin\_table[911] = 32'b01010001110011101101010001101110;

assign sin\_table[912] = 32'b01010001001100111100110010010100;

assign sin\_table[913] = 32'b01010000100101111111110001011110;

assign sin\_table[914] = 32'b01001111111110110110010101001101;

assign sin\_table[915] = 32'b01001111010111100000100011100011;

assign sin\_table[916] = 32'b01001110101111111110100010100100;

assign sin\_table[917] = 32'b01001110001000010000011000010111;

assign sin\_table[918] = 32'b01001101100000010110001011000100;

assign sin\_table[919] = 32'b01001100111000010000000000110100;

assign sin\_table[920] = 32'b01001100001111111101111111110011;

assign sin\_table[921] = 32'b01001011100111100000001110001111;

assign sin\_table[922] = 32'b01001010111110110110110010010111;

assign sin\_table[923] = 32'b01001010010110000001110010011101;

assign sin\_table[924] = 32'b01001001101101000001010100110011;

assign sin\_table[925] = 32'b01001001000011110101011111101110;

assign sin\_table[926] = 32'b01001000011010011110011001100100;

assign sin\_table[927] = 32'b01000111110000111100001000101110;

assign sin\_table[928] = 32'b01000111000111001110110011100110;

Продолжение листинга 1.1

assign sin\_table[929] = 32'b01000110011101010110100000100111;

assign sin\_table[930] = 32'b01000101110011010011010110001111;

assign sin\_table[931] = 32'b01000101001001000101011010111100;

assign sin\_table[932] = 32'b01000100011110101100110101010000;

assign sin\_table[933] = 32'b01000011110100001001101011101100;

assign sin\_table[934] = 32'b01000011001001011100000100110101;

assign sin\_table[935] = 32'b01000010011110100100000111010000;

assign sin\_table[936] = 32'b01000001110011100001111001100100;

assign sin\_table[937] = 32'b01000001001000010101100010011010;

assign sin\_table[938] = 32'b01000000011100111111001000011101;

assign sin\_table[939] = 32'b00111111110001011110110010010111;

assign sin\_table[940] = 32'b00111111000101110100100110110111;

assign sin\_table[941] = 32'b00111110011010000000101100101100;

assign sin\_table[942] = 32'b00111101101110000011001010100101;

assign sin\_table[943] = 32'b00111101000001111100000111010101;

assign sin\_table[944] = 32'b00111100010101101011101001110000;

assign sin\_table[945] = 32'b00111011101001010001111000101001;

assign sin\_table[946] = 32'b00111010111100101110111010110111;

assign sin\_table[947] = 32'b00111010010000000010110111010001;

assign sin\_table[948] = 32'b00111001100011001101110100110010;

assign sin\_table[949] = 32'b00111000110110001111111010010011;

assign sin\_table[950] = 32'b00111000001001001001001110110000;

assign sin\_table[951] = 32'b00110111011011111001111001000110;

assign sin\_table[952] = 32'b00110110101110100010000000010011;

assign sin\_table[953] = 32'b00110110000001000001101011011000;

assign sin\_table[954] = 32'b00110101010011011001000001010110;

assign sin\_table[955] = 32'b00110100100101101000001001001111;

assign sin\_table[956] = 32'b00110011110111101111001010000111;

assign sin\_table[957] = 32'b00110011001001101110001011000010;

assign sin\_table[958] = 32'b00110010011011100101010011000111;

assign sin\_table[959] = 32'b00110001101101010100101001011101;

assign sin\_table[960] = 32'b00110000111110111100010101001101;

assign sin\_table[961] = 32'b00110000010000011100011101100000;

assign sin\_table[962] = 32'b00101111100001110101001001100010;

assign sin\_table[963] = 32'b00101110110011000110100000011110;

assign sin\_table[964] = 32'b00101110000100010000101001100001;

assign sin\_table[965] = 32'b00101101010101010011101011111011;

assign sin\_table[966] = 32'b00101100100110001111101110111010;

assign sin\_table[967] = 32'b00101011110111000100111001101111;

assign sin\_table[968] = 32'b00101011000111110011010011101011;

assign sin\_table[969] = 32'b00101010011000011011000100000001;

assign sin\_table[970] = 32'b00101001101000111100010010000100;

assign sin\_table[971] = 32'b00101000111001010111000101001010;

assign sin\_table[972] = 32'b00101000001001101011100100101000;

assign sin\_table[973] = 32'b00100111011001111001110111110100;

assign sin\_table[974] = 32'b00100110101010000010000110000101;

assign sin\_table[975] = 32'b00100101111010000100010110110101;

assign sin\_table[976] = 32'b00100101001010000000110001011101;

assign sin\_table[977] = 32'b00100100011001110111011101010111;

assign sin\_table[978] = 32'b00100011101001101000100001111110;

assign sin\_table[979] = 32'b00100010111001010100000110101110;

assign sin\_table[980] = 32'b00100010001000111010010011000101;

assign sin\_table[981] = 32'b00100001011000011011001110011111;

assign sin\_table[982] = 32'b00100000100111110111000000011100;

assign sin\_table[983] = 32'b00011111110111001101110000011010;

assign sin\_table[984] = 32'b00011111000110011111100101111011;

Продолжение листинга 1.1

assign sin\_table[985] = 32'b00011110010101101100101000011110;

assign sin\_table[986] = 32'b00011101100100110100111111100101;

assign sin\_table[987] = 32'b00011100110011111000110010110011;

assign sin\_table[988] = 32'b00011100000010111000001001101010;

assign sin\_table[989] = 32'b00011011010001110011001011101111;

assign sin\_table[990] = 32'b00011010100000101010000000100101;

assign sin\_table[991] = 32'b00011001101111011100101111110010;

assign sin\_table[992] = 32'b00011000111110001011100000111100;

assign sin\_table[993] = 32'b00011000001100110110011011101000;

assign sin\_table[994] = 32'b00010111011011011101100111011110;

assign sin\_table[995] = 32'b00010110101010000001001100000100;

assign sin\_table[996] = 32'b00010101111000100001010001000100;

assign sin\_table[997] = 32'b00010101000110111101111110000101;

assign sin\_table[998] = 32'b00010100010101010111011010110001;

assign sin\_table[999] = 32'b00010011100011101101101110110000;

assign sin\_table[1000] = 32'b00010010110010000001000001101110;

assign sin\_table[1001] = 32'b00010010000000010001011011010100;

assign sin\_table[1002] = 32'b00010001001110011111000011001110;

assign sin\_table[1003] = 32'b00010000011100101010000001000111;

assign sin\_table[1004] = 32'b00001111101010110010011100101011;

assign sin\_table[1005] = 32'b00001110111000111000011101100101;

assign sin\_table[1006] = 32'b00001110000110111100001011100011;

assign sin\_table[1007] = 32'b00001101010100111101101110010010;

assign sin\_table[1008] = 32'b00001100100010111101001101011110;

assign sin\_table[1009] = 32'b00001011110000111010110000110101;

assign sin\_table[1010] = 32'b00001010111110110110100000000101;

assign sin\_table[1011] = 32'b00001010001100110000100010111100;

assign sin\_table[1012] = 32'b00001001011010101001000001001001;

assign sin\_table[1013] = 32'b00001000101000100000000010011010;

assign sin\_table[1014] = 32'b00000111110110010101101110011110;

assign sin\_table[1015] = 32'b00000111000100001010001101000100;

assign sin\_table[1016] = 32'b00000110010001111101100101111100;

assign sin\_table[1017] = 32'b00000101011111110000000000110100;

assign sin\_table[1018] = 32'b00000100101101100001100101011101;

assign sin\_table[1019] = 32'b00000011111011010010011011100110;

assign sin\_table[1020] = 32'b00000011001001000010101010111110;

assign sin\_table[1021] = 32'b00000010010110110010011011010111;

assign sin\_table[1022] = 32'b00000001100100100001110100011111;

assign sin\_table[1023] = 32'b00000000110010010000111110000111;

Листинг 1.2 – Заголовочный файл таблицы значений косинусов на языке Verilog

assign cos\_table[0] = 32'b10000000000000000000000000000000;

assign cos\_table[1] = 32'b01111111111111110110001000010110;

assign cos\_table[2] = 32'b01111111111111011000100001011010;

assign cos\_table[3] = 32'b01111111111110100111001011010001;

assign cos\_table[4] = 32'b01111111111101100010000110000010;

assign cos\_table[5] = 32'b01111111111100001001010001110111;

assign cos\_table[6] = 32'b01111111111010011100101110111111;

assign cos\_table[7] = 32'b01111111111000011100011101101011;

assign cos\_table[8] = 32'b01111111110110001000011110001101;

assign cos\_table[9] = 32'b01111111110011100000110000111110;

assign cos\_table[10] = 32'b01111111110000100101010110010110;

assign cos\_table[11] = 32'b01111111101101010110001110110010;

assign cos\_table[12] = 32'b01111111101001110011011010110100;

assign cos\_table[13] = 32'b01111111100101111100111010111100;

assign cos\_table[14] = 32'b01111111100001110010101111110010;

Продолжение листинга 1.2

assign cos\_table[15] = 32'b01111111011101010100111001111111;

assign cos\_table[16] = 32'b01111111011000100011011010001111;

assign cos\_table[17] = 32'b01111111010011011110010001010000;

assign cos\_table[18] = 32'b01111111001110000101011111110101;

assign cos\_table[19] = 32'b01111111001000011001000110110011;

assign cos\_table[20] = 32'b01111111000010011001000111000011;

assign cos\_table[21] = 32'b01111110111100000101100001011111;

assign cos\_table[22] = 32'b01111110110101011110010111000110;

assign cos\_table[23] = 32'b01111110101110100011101000111001;

assign cos\_table[24] = 32'b01111110100111010101010111111100;

assign cos\_table[25] = 32'b01111110011111110011100101010110;

assign cos\_table[26] = 32'b01111110010111111110010010010011;

assign cos\_table[27] = 32'b01111110001111110101011111111110;

assign cos\_table[28] = 32'b01111110000111011001001111101001;

assign cos\_table[29] = 32'b01111101111110101001100010100111;

assign cos\_table[30] = 32'b01111101110101100110011010001110;

assign cos\_table[31] = 32'b01111101101100001111110111110111;

assign cos\_table[32] = 32'b01111101100010100101111100111111;

assign cos\_table[33] = 32'b01111101011000101000101011000101;

assign cos\_table[34] = 32'b01111101001110011000000011101100;

assign cos\_table[35] = 32'b01111101000011110100001000010111;

assign cos\_table[36] = 32'b01111100111000111100111010110001;

assign cos\_table[37] = 32'b01111100101101110010011100100100;

assign cos\_table[38] = 32'b01111100100010010100101111011101;

assign cos\_table[39] = 32'b01111100010110100011110101001111;

assign cos\_table[40] = 32'b01111100001010011111101111101110;

assign cos\_table[41] = 32'b01111011111110001000100000110000;

assign cos\_table[42] = 32'b01111011110001011110001010001111;

assign cos\_table[43] = 32'b01111011100100100000101110001001;

assign cos\_table[44] = 32'b01111011010111010000001110011101;

assign cos\_table[45] = 32'b01111011001001101100101101001111;

assign cos\_table[46] = 32'b01111010111011110110001100100011;

assign cos\_table[47] = 32'b01111010101101101100101110100011;

assign cos\_table[48] = 32'b01111010011111010000010101011011;

assign cos\_table[49] = 32'b01111010010000100001000011011000;

assign cos\_table[50] = 32'b01111010000001011110111010101101;

assign cos\_table[51] = 32'b01111001110010001001111101101101;

assign cos\_table[52] = 32'b01111001100010100010001110110001;

assign cos\_table[53] = 32'b01111001010010100111110000010001;

assign cos\_table[54] = 32'b01111001000010011010100100101100;

assign cos\_table[55] = 32'b01111000110001111010101110100001;

assign cos\_table[56] = 32'b01111000100001001000010000010011;

assign cos\_table[57] = 32'b01111000010000000011001100101000;

assign cos\_table[58] = 32'b01110111111110101011100110001000;

assign cos\_table[59] = 32'b01110111101101000001011111011111;

assign cos\_table[60] = 32'b01110111011011000100111011011011;

assign cos\_table[61] = 32'b01110111001000110101111100101101;

assign cos\_table[62] = 32'b01110110110110010100100110001000;

assign cos\_table[63] = 32'b01110110100011100000111010100101;

assign cos\_table[64] = 32'b01110110010000011010111100111100;

assign cos\_table[65] = 32'b01110101111101000010110000001010;

assign cos\_table[66] = 32'b01110101101001011000010111001111;

assign cos\_table[67] = 32'b01110101010101011011110101001011;

assign cos\_table[68] = 32'b01110101000001001101001101000101;

assign cos\_table[69] = 32'b01110100101100101100100010000011;

assign cos\_table[70] = 32'b01110100010111111001110111010000;

Продолжение листинга 1.2

assign cos\_table[71] = 32'b01110100000010110101001111111010;

assign cos\_table[72] = 32'b01110011101101011110101111010000;

assign cos\_table[73] = 32'b01110011010111110110011000100110;

assign cos\_table[74] = 32'b01110011000001111100001111001111;

assign cos\_table[75] = 32'b01110010101011110000010110100110;

assign cos\_table[76] = 32'b01110010010101010010110010000100;

assign cos\_table[77] = 32'b01110001111110100011100101001000;

assign cos\_table[78] = 32'b01110001100111100010110011010010;

assign cos\_table[79] = 32'b01110001010000010000100000000100;

assign cos\_table[80] = 32'b01110000111000101100101111000110;

assign cos\_table[81] = 32'b01110000100000110111100011111110;

assign cos\_table[82] = 32'b01110000001000110001000010011001;

assign cos\_table[83] = 32'b01101111110000011001001110000101;

assign cos\_table[84] = 32'b01101111010111110000001010110001;

assign cos\_table[85] = 32'b01101110111110110101111100010010;

assign cos\_table[86] = 32'b01101110100101101010100110011100;

assign cos\_table[87] = 32'b01101110001100001110001101001001;

assign cos\_table[88] = 32'b01101101110010100000110100010100;

assign cos\_table[89] = 32'b01101101011000100010011111111010;

assign cos\_table[90] = 32'b01101100111110010011010011111011;

assign cos\_table[91] = 32'b01101100100011110011010100011100;

assign cos\_table[92] = 32'b01101100001001000010100101100000;

assign cos\_table[93] = 32'b01101011101110000001001011010000;

assign cos\_table[94] = 32'b01101011010010101111001001111000;

assign cos\_table[95] = 32'b01101010110111001100100101100100;

assign cos\_table[96] = 32'b01101010011011011001100010100100;

assign cos\_table[97] = 32'b01101001111111010110000101001010;

assign cos\_table[98] = 32'b01101001100011000010010001101100;

assign cos\_table[99] = 32'b01101001000110011110001100100000;

assign cos\_table[100] = 32'b01101000101001101001111010000001;

assign cos\_table[101] = 32'b01101000001100100101011110101010;

assign cos\_table[102] = 32'b01100111101111010000111110111100;

assign cos\_table[103] = 32'b01100111010001101100011111010111;

assign cos\_table[104] = 32'b01100110110011111000000100011111;

assign cos\_table[105] = 32'b01100110010101110011110010111011;

assign cos\_table[106] = 32'b01100101110111011111101111010011;

assign cos\_table[107] = 32'b01100101011000111011111110010010;

assign cos\_table[108] = 32'b01100100111010001000100100100110;

assign cos\_table[109] = 32'b01100100011011000101100110111111;

assign cos\_table[110] = 32'b01100011111011110011001010001111;

assign cos\_table[111] = 32'b01100011011100010001010011001100;

assign cos\_table[112] = 32'b01100010111100100000000110101100;

assign cos\_table[113] = 32'b01100010011100011111101001101001;

assign cos\_table[114] = 32'b01100001111100010000000000111110;

assign cos\_table[115] = 32'b01100001011011110001010001101011;

assign cos\_table[116] = 32'b01100000111011000011100000101111;

assign cos\_table[117] = 32'b01100000011010000110110011001110;

assign cos\_table[118] = 32'b01011111111000111011001110001101;

assign cos\_table[119] = 32'b01011111010111100000110110110011;

assign cos\_table[120] = 32'b01011110110101110111110010001001;

assign cos\_table[121] = 32'b01011110010100000000000101011101;

assign cos\_table[122] = 32'b01011101110001111001110101111100;

assign cos\_table[123] = 32'b01011101001111100101001000110110;

assign cos\_table[124] = 32'b01011100101101000010000011011111;

assign cos\_table[125] = 32'b01011100001010010000101011001100;

assign cos\_table[126] = 32'b01011011100111010001000101010011;

Продолжение листинга 1.2

assign cos\_table[127] = 32'b01011011000100000011010111001111;

assign cos\_table[128] = 32'b01011010100000100111100110011001;

assign cos\_table[129] = 32'b01011001111100111101111000010010;

assign cos\_table[130] = 32'b01011001011001000110010010010111;

assign cos\_table[131] = 32'b01011000110101000000111010001100;

assign cos\_table[132] = 32'b01011000010000101101110101010100;

assign cos\_table[133] = 32'b01010111101100001101001001010110;

assign cos\_table[134] = 32'b01010111000111011110111011111001;

assign cos\_table[135] = 32'b01010110100010100011010010101001;

assign cos\_table[136] = 32'b01010101111101011010010011010010;

assign cos\_table[137] = 32'b01010101011000000100000011100010;

assign cos\_table[138] = 32'b01010100110010100000101001001010;

assign cos\_table[139] = 32'b01010100001100110000001001111101;

assign cos\_table[140] = 32'b01010011100110110010101011101111;

assign cos\_table[141] = 32'b01010011000000101000010100010111;

assign cos\_table[142] = 32'b01010010011010010001001001101110;

assign cos\_table[143] = 32'b01010001110011101101010001101110;

assign cos\_table[144] = 32'b01010001001100111100110010010100;

assign cos\_table[145] = 32'b01010000100101111111110001011110;

assign cos\_table[146] = 32'b01001111111110110110010101001101;

assign cos\_table[147] = 32'b01001111010111100000100011100011;

assign cos\_table[148] = 32'b01001110101111111110100010100100;

assign cos\_table[149] = 32'b01001110001000010000011000010111;

assign cos\_table[150] = 32'b01001101100000010110001011000100;

assign cos\_table[151] = 32'b01001100111000010000000000110100;

assign cos\_table[152] = 32'b01001100001111111101111111110011;

assign cos\_table[153] = 32'b01001011100111100000001110001111;

assign cos\_table[154] = 32'b01001010111110110110110010010111;

assign cos\_table[155] = 32'b01001010010110000001110010011101;

assign cos\_table[156] = 32'b01001001101101000001010100110011;

assign cos\_table[157] = 32'b01001001000011110101011111101110;

assign cos\_table[158] = 32'b01001000011010011110011001100100;

assign cos\_table[159] = 32'b01000111110000111100001000101110;

assign cos\_table[160] = 32'b01000111000111001110110011100110;

assign cos\_table[161] = 32'b01000110011101010110100000100111;

assign cos\_table[162] = 32'b01000101110011010011010110001111;

assign cos\_table[163] = 32'b01000101001001000101011010111100;

assign cos\_table[164] = 32'b01000100011110101100110101010000;

assign cos\_table[165] = 32'b01000011110100001001101011101100;

assign cos\_table[166] = 32'b01000011001001011100000100110101;

assign cos\_table[167] = 32'b01000010011110100100000111010000;

assign cos\_table[168] = 32'b01000001110011100001111001100100;

assign cos\_table[169] = 32'b01000001001000010101100010011010;

assign cos\_table[170] = 32'b01000000011100111111001000011101;

assign cos\_table[171] = 32'b00111111110001011110110010010111;

assign cos\_table[172] = 32'b00111111000101110100100110110111;

assign cos\_table[173] = 32'b00111110011010000000101100101100;

assign cos\_table[174] = 32'b00111101101110000011001010100101;

assign cos\_table[175] = 32'b00111101000001111100000111010101;

assign cos\_table[176] = 32'b00111100010101101011101001110000;

assign cos\_table[177] = 32'b00111011101001010001111000101001;

assign cos\_table[178] = 32'b00111010111100101110111010110111;

assign cos\_table[179] = 32'b00111010010000000010110111010001;

assign cos\_table[180] = 32'b00111001100011001101110100110010;

assign cos\_table[181] = 32'b00111000110110001111111010010011;

assign cos\_table[182] = 32'b00111000001001001001001110110000;

Продолжение листинга 1.2

assign cos\_table[183] = 32'b00110111011011111001111001000110;

assign cos\_table[184] = 32'b00110110101110100010000000010011;

assign cos\_table[185] = 32'b00110110000001000001101011011000;

assign cos\_table[186] = 32'b00110101010011011001000001010110;

assign cos\_table[187] = 32'b00110100100101101000001001001111;

assign cos\_table[188] = 32'b00110011110111101111001010000111;

assign cos\_table[189] = 32'b00110011001001101110001011000010;

assign cos\_table[190] = 32'b00110010011011100101010011000111;

assign cos\_table[191] = 32'b00110001101101010100101001011101;

assign cos\_table[192] = 32'b00110000111110111100010101001101;

assign cos\_table[193] = 32'b00110000010000011100011101100000;

assign cos\_table[194] = 32'b00101111100001110101001001100010;

assign cos\_table[195] = 32'b00101110110011000110100000011110;

assign cos\_table[196] = 32'b00101110000100010000101001100001;

assign cos\_table[197] = 32'b00101101010101010011101011111011;

assign cos\_table[198] = 32'b00101100100110001111101110111010;

assign cos\_table[199] = 32'b00101011110111000100111001101111;

assign cos\_table[200] = 32'b00101011000111110011010011101011;

assign cos\_table[201] = 32'b00101010011000011011000100000001;

assign cos\_table[202] = 32'b00101001101000111100010010000100;

assign cos\_table[203] = 32'b00101000111001010111000101001010;

assign cos\_table[204] = 32'b00101000001001101011100100101000;

assign cos\_table[205] = 32'b00100111011001111001110111110100;

assign cos\_table[206] = 32'b00100110101010000010000110000101;

assign cos\_table[207] = 32'b00100101111010000100010110110101;

assign cos\_table[208] = 32'b00100101001010000000110001011101;

assign cos\_table[209] = 32'b00100100011001110111011101010111;

assign cos\_table[210] = 32'b00100011101001101000100001111110;

assign cos\_table[211] = 32'b00100010111001010100000110101110;

assign cos\_table[212] = 32'b00100010001000111010010011000101;

assign cos\_table[213] = 32'b00100001011000011011001110011111;

assign cos\_table[214] = 32'b00100000100111110111000000011100;

assign cos\_table[215] = 32'b00011111110111001101110000011010;

assign cos\_table[216] = 32'b00011111000110011111100101111011;

assign cos\_table[217] = 32'b00011110010101101100101000011110;

assign cos\_table[218] = 32'b00011101100100110100111111100101;

assign cos\_table[219] = 32'b00011100110011111000110010110011;

assign cos\_table[220] = 32'b00011100000010111000001001101010;

assign cos\_table[221] = 32'b00011011010001110011001011101111;

assign cos\_table[222] = 32'b00011010100000101010000000100101;

assign cos\_table[223] = 32'b00011001101111011100101111110010;

assign cos\_table[224] = 32'b00011000111110001011100000111100;

assign cos\_table[225] = 32'b00011000001100110110011011101000;

assign cos\_table[226] = 32'b00010111011011011101100111011110;

assign cos\_table[227] = 32'b00010110101010000001001100000100;

assign cos\_table[228] = 32'b00010101111000100001010001000100;

assign cos\_table[229] = 32'b00010101000110111101111110000101;

assign cos\_table[230] = 32'b00010100010101010111011010110001;

assign cos\_table[231] = 32'b00010011100011101101101110110000;

assign cos\_table[232] = 32'b00010010110010000001000001101110;

assign cos\_table[233] = 32'b00010010000000010001011011010100;

assign cos\_table[234] = 32'b00010001001110011111000011001110;

assign cos\_table[235] = 32'b00010000011100101010000001000111;

assign cos\_table[236] = 32'b00001111101010110010011100101011;

assign cos\_table[237] = 32'b00001110111000111000011101100101;

assign cos\_table[238] = 32'b00001110000110111100001011100011;

Продолжение листинга 1.2

assign cos\_table[239] = 32'b00001101010100111101101110010010;

assign cos\_table[240] = 32'b00001100100010111101001101011110;

assign cos\_table[241] = 32'b00001011110000111010110000110101;

assign cos\_table[242] = 32'b00001010111110110110100000000101;

assign cos\_table[243] = 32'b00001010001100110000100010111100;

assign cos\_table[244] = 32'b00001001011010101001000001001001;

assign cos\_table[245] = 32'b00001000101000100000000010011010;

assign cos\_table[246] = 32'b00000111110110010101101110011110;

assign cos\_table[247] = 32'b00000111000100001010001101000100;

assign cos\_table[248] = 32'b00000110010001111101100101111100;

assign cos\_table[249] = 32'b00000101011111110000000000110100;

assign cos\_table[250] = 32'b00000100101101100001100101011101;

assign cos\_table[251] = 32'b00000011111011010010011011100110;

assign cos\_table[252] = 32'b00000011001001000010101010111110;

assign cos\_table[253] = 32'b00000010010110110010011011010111;

assign cos\_table[254] = 32'b00000001100100100001110100011111;

assign cos\_table[255] = 32'b00000000110010010000111110000111;

assign cos\_table[256] = 32'b00000000000000000000000000000000;

assign cos\_table[257] = 32'b00000000110010010000111110000111;

assign cos\_table[258] = 32'b00000001100100100001110100011111;

assign cos\_table[259] = 32'b00000010010110110010011011010111;

assign cos\_table[260] = 32'b00000011001001000010101010111110;

assign cos\_table[261] = 32'b00000011111011010010011011100110;

assign cos\_table[262] = 32'b00000100101101100001100101011101;

assign cos\_table[263] = 32'b00000101011111110000000000110100;

assign cos\_table[264] = 32'b00000110010001111101100101111100;

assign cos\_table[265] = 32'b00000111000100001010001101000100;

assign cos\_table[266] = 32'b00000111110110010101101110011110;

assign cos\_table[267] = 32'b00001000101000100000000010011010;

assign cos\_table[268] = 32'b00001001011010101001000001001001;

assign cos\_table[269] = 32'b00001010001100110000100010111100;

assign cos\_table[270] = 32'b00001010111110110110100000000101;

assign cos\_table[271] = 32'b00001011110000111010110000110101;

assign cos\_table[272] = 32'b00001100100010111101001101011110;

assign cos\_table[273] = 32'b00001101010100111101101110010010;

assign cos\_table[274] = 32'b00001110000110111100001011100011;

assign cos\_table[275] = 32'b00001110111000111000011101100101;

assign cos\_table[276] = 32'b00001111101010110010011100101011;

assign cos\_table[277] = 32'b00010000011100101010000001000111;

assign cos\_table[278] = 32'b00010001001110011111000011001110;

assign cos\_table[279] = 32'b00010010000000010001011011010100;

assign cos\_table[280] = 32'b00010010110010000001000001101110;

assign cos\_table[281] = 32'b00010011100011101101101110110000;

assign cos\_table[282] = 32'b00010100010101010111011010110001;

assign cos\_table[283] = 32'b00010101000110111101111110000101;

assign cos\_table[284] = 32'b00010101111000100001010001000100;

assign cos\_table[285] = 32'b00010110101010000001001100000100;

assign cos\_table[286] = 32'b00010111011011011101100111011110;

assign cos\_table[287] = 32'b00011000001100110110011011101000;

assign cos\_table[288] = 32'b00011000111110001011100000111100;

assign cos\_table[289] = 32'b00011001101111011100101111110010;

assign cos\_table[290] = 32'b00011010100000101010000000100101;

assign cos\_table[291] = 32'b00011011010001110011001011101111;

assign cos\_table[292] = 32'b00011100000010111000001001101010;

assign cos\_table[293] = 32'b00011100110011111000110010110011;

assign cos\_table[294] = 32'b00011101100100110100111111100101;

Продолжение листинга 1.2

assign cos\_table[295] = 32'b00011110010101101100101000011110;

assign cos\_table[296] = 32'b00011111000110011111100101111011;

assign cos\_table[297] = 32'b00011111110111001101110000011010;

assign cos\_table[298] = 32'b00100000100111110111000000011100;

assign cos\_table[299] = 32'b00100001011000011011001110011111;

assign cos\_table[300] = 32'b00100010001000111010010011000101;

assign cos\_table[301] = 32'b00100010111001010100000110101110;

assign cos\_table[302] = 32'b00100011101001101000100001111110;

assign cos\_table[303] = 32'b00100100011001110111011101010111;

assign cos\_table[304] = 32'b00100101001010000000110001011101;

assign cos\_table[305] = 32'b00100101111010000100010110110101;

assign cos\_table[306] = 32'b00100110101010000010000110000101;

assign cos\_table[307] = 32'b00100111011001111001110111110100;

assign cos\_table[308] = 32'b00101000001001101011100100101000;

assign cos\_table[309] = 32'b00101000111001010111000101001010;

assign cos\_table[310] = 32'b00101001101000111100010010000100;

assign cos\_table[311] = 32'b00101010011000011011000100000001;

assign cos\_table[312] = 32'b00101011000111110011010011101011;

assign cos\_table[313] = 32'b00101011110111000100111001101111;

assign cos\_table[314] = 32'b00101100100110001111101110111010;

assign cos\_table[315] = 32'b00101101010101010011101011111011;

assign cos\_table[316] = 32'b00101110000100010000101001100001;

assign cos\_table[317] = 32'b00101110110011000110100000011110;

assign cos\_table[318] = 32'b00101111100001110101001001100010;

assign cos\_table[319] = 32'b00110000010000011100011101100000;

assign cos\_table[320] = 32'b00110000111110111100010101001101;

assign cos\_table[321] = 32'b00110001101101010100101001011101;

assign cos\_table[322] = 32'b00110010011011100101010011000111;

assign cos\_table[323] = 32'b00110011001001101110001011000010;

assign cos\_table[324] = 32'b00110011110111101111001010000111;

assign cos\_table[325] = 32'b00110100100101101000001001001111;

assign cos\_table[326] = 32'b00110101010011011001000001010110;

assign cos\_table[327] = 32'b00110110000001000001101011011000;

assign cos\_table[328] = 32'b00110110101110100010000000010011;

assign cos\_table[329] = 32'b00110111011011111001111001000110;

assign cos\_table[330] = 32'b00111000001001001001001110110000;

assign cos\_table[331] = 32'b00111000110110001111111010010011;

assign cos\_table[332] = 32'b00111001100011001101110100110010;

assign cos\_table[333] = 32'b00111010010000000010110111010001;

assign cos\_table[334] = 32'b00111010111100101110111010110111;

assign cos\_table[335] = 32'b00111011101001010001111000101001;

assign cos\_table[336] = 32'b00111100010101101011101001110000;

assign cos\_table[337] = 32'b00111101000001111100000111010101;

assign cos\_table[338] = 32'b00111101101110000011001010100101;

assign cos\_table[339] = 32'b00111110011010000000101100101100;

assign cos\_table[340] = 32'b00111111000101110100100110110111;

assign cos\_table[341] = 32'b00111111110001011110110010010111;

assign cos\_table[342] = 32'b01000000011100111111001000011101;

assign cos\_table[343] = 32'b01000001001000010101100010011010;

assign cos\_table[344] = 32'b01000001110011100001111001100100;

assign cos\_table[345] = 32'b01000010011110100100000111010000;

assign cos\_table[346] = 32'b01000011001001011100000100110101;

assign cos\_table[347] = 32'b01000011110100001001101011101100;

assign cos\_table[348] = 32'b01000100011110101100110101010000;

assign cos\_table[349] = 32'b01000101001001000101011010111100;

assign cos\_table[350] = 32'b01000101110011010011010110001111;

Продолжение листинга 1.2

assign cos\_table[351] = 32'b01000110011101010110100000100111;

assign cos\_table[352] = 32'b01000111000111001110110011100110;

assign cos\_table[353] = 32'b01000111110000111100001000101110;

assign cos\_table[354] = 32'b01001000011010011110011001100100;

assign cos\_table[355] = 32'b01001001000011110101011111101110;

assign cos\_table[356] = 32'b01001001101101000001010100110011;

assign cos\_table[357] = 32'b01001010010110000001110010011101;

assign cos\_table[358] = 32'b01001010111110110110110010010111;

assign cos\_table[359] = 32'b01001011100111100000001110001111;

assign cos\_table[360] = 32'b01001100001111111101111111110011;

assign cos\_table[361] = 32'b01001100111000010000000000110100;

assign cos\_table[362] = 32'b01001101100000010110001011000100;

assign cos\_table[363] = 32'b01001110001000010000011000010111;

assign cos\_table[364] = 32'b01001110101111111110100010100100;

assign cos\_table[365] = 32'b01001111010111100000100011100011;

assign cos\_table[366] = 32'b01001111111110110110010101001101;

assign cos\_table[367] = 32'b01010000100101111111110001011110;

assign cos\_table[368] = 32'b01010001001100111100110010010100;

assign cos\_table[369] = 32'b01010001110011101101010001101110;

assign cos\_table[370] = 32'b01010010011010010001001001101110;

assign cos\_table[371] = 32'b01010011000000101000010100010111;

assign cos\_table[372] = 32'b01010011100110110010101011101111;

assign cos\_table[373] = 32'b01010100001100110000001001111101;

assign cos\_table[374] = 32'b01010100110010100000101001001010;

assign cos\_table[375] = 32'b01010101011000000100000011100010;

assign cos\_table[376] = 32'b01010101111101011010010011010010;

assign cos\_table[377] = 32'b01010110100010100011010010101001;

assign cos\_table[378] = 32'b01010111000111011110111011111001;

assign cos\_table[379] = 32'b01010111101100001101001001010110;

assign cos\_table[380] = 32'b01011000010000101101110101010100;

assign cos\_table[381] = 32'b01011000110101000000111010001100;

assign cos\_table[382] = 32'b01011001011001000110010010010111;

assign cos\_table[383] = 32'b01011001111100111101111000010010;

assign cos\_table[384] = 32'b01011010100000100111100110011001;

assign cos\_table[385] = 32'b01011011000100000011010111001111;

assign cos\_table[386] = 32'b01011011100111010001000101010011;

assign cos\_table[387] = 32'b01011100001010010000101011001100;

assign cos\_table[388] = 32'b01011100101101000010000011011111;

assign cos\_table[389] = 32'b01011101001111100101001000110110;

assign cos\_table[390] = 32'b01011101110001111001110101111100;

assign cos\_table[391] = 32'b01011110010100000000000101011101;

assign cos\_table[392] = 32'b01011110110101110111110010001001;

assign cos\_table[393] = 32'b01011111010111100000110110110011;

assign cos\_table[394] = 32'b01011111111000111011001110001101;

assign cos\_table[395] = 32'b01100000011010000110110011001110;

assign cos\_table[396] = 32'b01100000111011000011100000101111;

assign cos\_table[397] = 32'b01100001011011110001010001101011;

assign cos\_table[398] = 32'b01100001111100010000000000111110;

assign cos\_table[399] = 32'b01100010011100011111101001101001;

assign cos\_table[400] = 32'b01100010111100100000000110101100;

assign cos\_table[401] = 32'b01100011011100010001010011001100;

assign cos\_table[402] = 32'b01100011111011110011001010001111;

assign cos\_table[403] = 32'b01100100011011000101100110111111;

assign cos\_table[404] = 32'b01100100111010001000100100100110;

assign cos\_table[405] = 32'b01100101011000111011111110010010;

assign cos\_table[406] = 32'b01100101110111011111101111010011;

Продолжение листинга 1.2

assign cos\_table[407] = 32'b01100110010101110011110010111011;

assign cos\_table[408] = 32'b01100110110011111000000100011111;

assign cos\_table[409] = 32'b01100111010001101100011111010111;

assign cos\_table[410] = 32'b01100111101111010000111110111100;

assign cos\_table[411] = 32'b01101000001100100101011110101010;

assign cos\_table[412] = 32'b01101000101001101001111010000001;

assign cos\_table[413] = 32'b01101001000110011110001100100000;

assign cos\_table[414] = 32'b01101001100011000010010001101100;

assign cos\_table[415] = 32'b01101001111111010110000101001010;

assign cos\_table[416] = 32'b01101010011011011001100010100100;

assign cos\_table[417] = 32'b01101010110111001100100101100100;

assign cos\_table[418] = 32'b01101011010010101111001001111000;

assign cos\_table[419] = 32'b01101011101110000001001011010000;

assign cos\_table[420] = 32'b01101100001001000010100101100000;

assign cos\_table[421] = 32'b01101100100011110011010100011100;

assign cos\_table[422] = 32'b01101100111110010011010011111011;

assign cos\_table[423] = 32'b01101101011000100010011111111010;

assign cos\_table[424] = 32'b01101101110010100000110100010100;

assign cos\_table[425] = 32'b01101110001100001110001101001001;

assign cos\_table[426] = 32'b01101110100101101010100110011100;

assign cos\_table[427] = 32'b01101110111110110101111100010010;

assign cos\_table[428] = 32'b01101111010111110000001010110001;

assign cos\_table[429] = 32'b01101111110000011001001110000101;

assign cos\_table[430] = 32'b01110000001000110001000010011001;

assign cos\_table[431] = 32'b01110000100000110111100011111110;

assign cos\_table[432] = 32'b01110000111000101100101111000110;

assign cos\_table[433] = 32'b01110001010000010000100000000100;

assign cos\_table[434] = 32'b01110001100111100010110011010010;

assign cos\_table[435] = 32'b01110001111110100011100101001000;

assign cos\_table[436] = 32'b01110010010101010010110010000100;

assign cos\_table[437] = 32'b01110010101011110000010110100110;

assign cos\_table[438] = 32'b01110011000001111100001111001111;

assign cos\_table[439] = 32'b01110011010111110110011000100110;

assign cos\_table[440] = 32'b01110011101101011110101111010000;

assign cos\_table[441] = 32'b01110100000010110101001111111010;

assign cos\_table[442] = 32'b01110100010111111001110111010000;

assign cos\_table[443] = 32'b01110100101100101100100010000011;

assign cos\_table[444] = 32'b01110101000001001101001101000101;

assign cos\_table[445] = 32'b01110101010101011011110101001011;

assign cos\_table[446] = 32'b01110101101001011000010111001111;

assign cos\_table[447] = 32'b01110101111101000010110000001010;

assign cos\_table[448] = 32'b01110110010000011010111100111100;

assign cos\_table[449] = 32'b01110110100011100000111010100101;

assign cos\_table[450] = 32'b01110110110110010100100110001000;

assign cos\_table[451] = 32'b01110111001000110101111100101101;

assign cos\_table[452] = 32'b01110111011011000100111011011011;

assign cos\_table[453] = 32'b01110111101101000001011111011111;

assign cos\_table[454] = 32'b01110111111110101011100110001000;

assign cos\_table[455] = 32'b01111000010000000011001100101000;

assign cos\_table[456] = 32'b01111000100001001000010000010011;

assign cos\_table[457] = 32'b01111000110001111010101110100001;

assign cos\_table[458] = 32'b01111001000010011010100100101100;

assign cos\_table[459] = 32'b01111001010010100111110000010001;

assign cos\_table[460] = 32'b01111001100010100010001110110001;

assign cos\_table[461] = 32'b01111001110010001001111101101101;

assign cos\_table[462] = 32'b01111010000001011110111010101101;

Продолжение листинга 1.2

assign cos\_table[463] = 32'b01111010010000100001000011011000;

assign cos\_table[464] = 32'b01111010011111010000010101011011;

assign cos\_table[465] = 32'b01111010101101101100101110100011;

assign cos\_table[466] = 32'b01111010111011110110001100100011;

assign cos\_table[467] = 32'b01111011001001101100101101001111;

assign cos\_table[468] = 32'b01111011010111010000001110011101;

assign cos\_table[469] = 32'b01111011100100100000101110001001;

assign cos\_table[470] = 32'b01111011110001011110001010001111;

assign cos\_table[471] = 32'b01111011111110001000100000110000;

assign cos\_table[472] = 32'b01111100001010011111101111101110;

assign cos\_table[473] = 32'b01111100010110100011110101001111;

assign cos\_table[474] = 32'b01111100100010010100101111011101;

assign cos\_table[475] = 32'b01111100101101110010011100100100;

assign cos\_table[476] = 32'b01111100111000111100111010110001;

assign cos\_table[477] = 32'b01111101000011110100001000010111;

assign cos\_table[478] = 32'b01111101001110011000000011101100;

assign cos\_table[479] = 32'b01111101011000101000101011000101;

assign cos\_table[480] = 32'b01111101100010100101111100111111;

assign cos\_table[481] = 32'b01111101101100001111110111110111;

assign cos\_table[482] = 32'b01111101110101100110011010001110;

assign cos\_table[483] = 32'b01111101111110101001100010100111;

assign cos\_table[484] = 32'b01111110000111011001001111101001;

assign cos\_table[485] = 32'b01111110001111110101011111111110;

assign cos\_table[486] = 32'b01111110010111111110010010010011;

assign cos\_table[487] = 32'b01111110011111110011100101010110;

assign cos\_table[488] = 32'b01111110100111010101010111111100;

assign cos\_table[489] = 32'b01111110101110100011101000111001;

assign cos\_table[490] = 32'b01111110110101011110010111000110;

assign cos\_table[491] = 32'b01111110111100000101100001011111;

assign cos\_table[492] = 32'b01111111000010011001000111000011;

assign cos\_table[493] = 32'b01111111001000011001000110110011;

assign cos\_table[494] = 32'b01111111001110000101011111110101;

assign cos\_table[495] = 32'b01111111010011011110010001010000;

assign cos\_table[496] = 32'b01111111011000100011011010001111;

assign cos\_table[497] = 32'b01111111011101010100111001111111;

assign cos\_table[498] = 32'b01111111100001110010101111110010;

assign cos\_table[499] = 32'b01111111100101111100111010111100;

assign cos\_table[500] = 32'b01111111101001110011011010110100;

assign cos\_table[501] = 32'b01111111101101010110001110110010;

assign cos\_table[502] = 32'b01111111110000100101010110010110;

assign cos\_table[503] = 32'b01111111110011100000110000111110;

assign cos\_table[504] = 32'b01111111110110001000011110001101;

assign cos\_table[505] = 32'b01111111111000011100011101101011;

assign cos\_table[506] = 32'b01111111111010011100101110111111;

assign cos\_table[507] = 32'b01111111111100001001010001110111;

assign cos\_table[508] = 32'b01111111111101100010000110000010;

assign cos\_table[509] = 32'b01111111111110100111001011010001;

assign cos\_table[510] = 32'b01111111111111011000100001011010;

assign cos\_table[511] = 32'b01111111111111110110001000010110;

assign cos\_table[512] = 32'b10000000000000000000000000000000;

assign cos\_table[513] = 32'b01111111111111110110001000010110;

assign cos\_table[514] = 32'b01111111111111011000100001011010;

assign cos\_table[515] = 32'b01111111111110100111001011010001;

assign cos\_table[516] = 32'b01111111111101100010000110000010;

assign cos\_table[517] = 32'b01111111111100001001010001110111;

assign cos\_table[518] = 32'b01111111111010011100101110111111;

Продолжение листинга 1.2

assign cos\_table[519] = 32'b01111111111000011100011101101011;

assign cos\_table[520] = 32'b01111111110110001000011110001101;

assign cos\_table[521] = 32'b01111111110011100000110000111110;

assign cos\_table[522] = 32'b01111111110000100101010110010110;

assign cos\_table[523] = 32'b01111111101101010110001110110010;

assign cos\_table[524] = 32'b01111111101001110011011010110100;

assign cos\_table[525] = 32'b01111111100101111100111010111100;

assign cos\_table[526] = 32'b01111111100001110010101111110010;

assign cos\_table[527] = 32'b01111111011101010100111001111111;

assign cos\_table[528] = 32'b01111111011000100011011010001111;

assign cos\_table[529] = 32'b01111111010011011110010001010000;

assign cos\_table[530] = 32'b01111111001110000101011111110101;

assign cos\_table[531] = 32'b01111111001000011001000110110011;

assign cos\_table[532] = 32'b01111111000010011001000111000011;

assign cos\_table[533] = 32'b01111110111100000101100001011111;

assign cos\_table[534] = 32'b01111110110101011110010111000110;

assign cos\_table[535] = 32'b01111110101110100011101000111001;

assign cos\_table[536] = 32'b01111110100111010101010111111100;

assign cos\_table[537] = 32'b01111110011111110011100101010110;

assign cos\_table[538] = 32'b01111110010111111110010010010011;

assign cos\_table[539] = 32'b01111110001111110101011111111110;

assign cos\_table[540] = 32'b01111110000111011001001111101001;

assign cos\_table[541] = 32'b01111101111110101001100010100111;

assign cos\_table[542] = 32'b01111101110101100110011010001110;

assign cos\_table[543] = 32'b01111101101100001111110111110111;

assign cos\_table[544] = 32'b01111101100010100101111100111111;

assign cos\_table[545] = 32'b01111101011000101000101011000101;

assign cos\_table[546] = 32'b01111101001110011000000011101100;

assign cos\_table[547] = 32'b01111101000011110100001000010111;

assign cos\_table[548] = 32'b01111100111000111100111010110001;

assign cos\_table[549] = 32'b01111100101101110010011100100100;

assign cos\_table[550] = 32'b01111100100010010100101111011101;

assign cos\_table[551] = 32'b01111100010110100011110101001111;

assign cos\_table[552] = 32'b01111100001010011111101111101110;

assign cos\_table[553] = 32'b01111011111110001000100000110000;

assign cos\_table[554] = 32'b01111011110001011110001010001111;

assign cos\_table[555] = 32'b01111011100100100000101110001001;

assign cos\_table[556] = 32'b01111011010111010000001110011101;

assign cos\_table[557] = 32'b01111011001001101100101101001111;

assign cos\_table[558] = 32'b01111010111011110110001100100011;

assign cos\_table[559] = 32'b01111010101101101100101110100011;

assign cos\_table[560] = 32'b01111010011111010000010101011011;

assign cos\_table[561] = 32'b01111010010000100001000011011000;

assign cos\_table[562] = 32'b01111010000001011110111010101101;

assign cos\_table[563] = 32'b01111001110010001001111101101101;

assign cos\_table[564] = 32'b01111001100010100010001110110001;

assign cos\_table[565] = 32'b01111001010010100111110000010001;

assign cos\_table[566] = 32'b01111001000010011010100100101100;

assign cos\_table[567] = 32'b01111000110001111010101110100001;

assign cos\_table[568] = 32'b01111000100001001000010000010011;

assign cos\_table[569] = 32'b01111000010000000011001100101000;

assign cos\_table[570] = 32'b01110111111110101011100110001000;

assign cos\_table[571] = 32'b01110111101101000001011111011111;

assign cos\_table[572] = 32'b01110111011011000100111011011011;

assign cos\_table[573] = 32'b01110111001000110101111100101101;

assign cos\_table[574] = 32'b01110110110110010100100110001000;

Продолжение листинга 1.2

assign cos\_table[575] = 32'b01110110100011100000111010100101;

assign cos\_table[576] = 32'b01110110010000011010111100111100;

assign cos\_table[577] = 32'b01110101111101000010110000001010;

assign cos\_table[578] = 32'b01110101101001011000010111001111;

assign cos\_table[579] = 32'b01110101010101011011110101001011;

assign cos\_table[580] = 32'b01110101000001001101001101000101;

assign cos\_table[581] = 32'b01110100101100101100100010000011;

assign cos\_table[582] = 32'b01110100010111111001110111010000;

assign cos\_table[583] = 32'b01110100000010110101001111111010;

assign cos\_table[584] = 32'b01110011101101011110101111010000;

assign cos\_table[585] = 32'b01110011010111110110011000100110;

assign cos\_table[586] = 32'b01110011000001111100001111001111;

assign cos\_table[587] = 32'b01110010101011110000010110100110;

assign cos\_table[588] = 32'b01110010010101010010110010000100;

assign cos\_table[589] = 32'b01110001111110100011100101001000;

assign cos\_table[590] = 32'b01110001100111100010110011010010;

assign cos\_table[591] = 32'b01110001010000010000100000000100;

assign cos\_table[592] = 32'b01110000111000101100101111000110;

assign cos\_table[593] = 32'b01110000100000110111100011111110;

assign cos\_table[594] = 32'b01110000001000110001000010011001;

assign cos\_table[595] = 32'b01101111110000011001001110000101;

assign cos\_table[596] = 32'b01101111010111110000001010110001;

assign cos\_table[597] = 32'b01101110111110110101111100010010;

assign cos\_table[598] = 32'b01101110100101101010100110011100;

assign cos\_table[599] = 32'b01101110001100001110001101001001;

assign cos\_table[600] = 32'b01101101110010100000110100010100;

assign cos\_table[601] = 32'b01101101011000100010011111111010;

assign cos\_table[602] = 32'b01101100111110010011010011111011;

assign cos\_table[603] = 32'b01101100100011110011010100011100;

assign cos\_table[604] = 32'b01101100001001000010100101100000;

assign cos\_table[605] = 32'b01101011101110000001001011010000;

assign cos\_table[606] = 32'b01101011010010101111001001111000;

assign cos\_table[607] = 32'b01101010110111001100100101100100;

assign cos\_table[608] = 32'b01101010011011011001100010100100;

assign cos\_table[609] = 32'b01101001111111010110000101001010;

assign cos\_table[610] = 32'b01101001100011000010010001101100;

assign cos\_table[611] = 32'b01101001000110011110001100100000;

assign cos\_table[612] = 32'b01101000101001101001111010000001;

assign cos\_table[613] = 32'b01101000001100100101011110101010;

assign cos\_table[614] = 32'b01100111101111010000111110111100;

assign cos\_table[615] = 32'b01100111010001101100011111010111;

assign cos\_table[616] = 32'b01100110110011111000000100011111;

assign cos\_table[617] = 32'b01100110010101110011110010111011;

assign cos\_table[618] = 32'b01100101110111011111101111010011;

assign cos\_table[619] = 32'b01100101011000111011111110010010;

assign cos\_table[620] = 32'b01100100111010001000100100100110;

assign cos\_table[621] = 32'b01100100011011000101100110111111;

assign cos\_table[622] = 32'b01100011111011110011001010001111;

assign cos\_table[623] = 32'b01100011011100010001010011001100;

assign cos\_table[624] = 32'b01100010111100100000000110101100;

assign cos\_table[625] = 32'b01100010011100011111101001101001;

assign cos\_table[626] = 32'b01100001111100010000000000111110;

assign cos\_table[627] = 32'b01100001011011110001010001101011;

assign cos\_table[628] = 32'b01100000111011000011100000101111;

assign cos\_table[629] = 32'b01100000011010000110110011001110;

assign cos\_table[630] = 32'b01011111111000111011001110001101;

assign cos\_table[631] = 32'b01011111010111100000110110110011;

assign cos\_table[632] = 32'b01011110110101110111110010001001;

assign cos\_table[633] = 32'b01011110010100000000000101011101;

assign cos\_table[634] = 32'b01011101110001111001110101111100;

assign cos\_table[635] = 32'b01011101001111100101001000110110;

assign cos\_table[636] = 32'b01011100101101000010000011011111;

assign cos\_table[637] = 32'b01011100001010010000101011001100;

assign cos\_table[638] = 32'b01011011100111010001000101010011;

assign cos\_table[639] = 32'b01011011000100000011010111001111;

assign cos\_table[640] = 32'b01011010100000100111100110011001;

assign cos\_table[641] = 32'b01011001111100111101111000010010;

assign cos\_table[642] = 32'b01011001011001000110010010010111;

assign cos\_table[643] = 32'b01011000110101000000111010001100;

assign cos\_table[644] = 32'b01011000010000101101110101010100;

assign cos\_table[645] = 32'b01010111101100001101001001010110;

assign cos\_table[646] = 32'b01010111000111011110111011111001;

assign cos\_table[647] = 32'b01010110100010100011010010101001;

assign cos\_table[648] = 32'b01010101111101011010010011010010;

assign cos\_table[649] = 32'b01010101011000000100000011100010;

assign cos\_table[650] = 32'b01010100110010100000101001001010;

assign cos\_table[651] = 32'b01010100001100110000001001111101;

assign cos\_table[652] = 32'b01010011100110110010101011101111;

assign cos\_table[653] = 32'b01010011000000101000010100010111;

assign cos\_table[654] = 32'b01010010011010010001001001101110;

assign cos\_table[655] = 32'b01010001110011101101010001101110;

assign cos\_table[656] = 32'b01010001001100111100110010010100;

assign cos\_table[657] = 32'b01010000100101111111110001011110;

assign cos\_table[658] = 32'b01001111111110110110010101001101;

assign cos\_table[659] = 32'b01001111010111100000100011100011;

assign cos\_table[660] = 32'b01001110101111111110100010100100;

assign cos\_table[661] = 32'b01001110001000010000011000010111;

assign cos\_table[662] = 32'b01001101100000010110001011000100;

assign cos\_table[663] = 32'b01001100111000010000000000110100;

assign cos\_table[664] = 32'b01001100001111111101111111110011;

assign cos\_table[665] = 32'b01001011100111100000001110001111;

assign cos\_table[666] = 32'b01001010111110110110110010010111;

assign cos\_table[667] = 32'b01001010010110000001110010011101;

assign cos\_table[668] = 32'b01001001101101000001010100110011;

assign cos\_table[669] = 32'b01001001000011110101011111101110;

assign cos\_table[670] = 32'b01001000011010011110011001100100;

assign cos\_table[671] = 32'b01000111110000111100001000101110;

assign cos\_table[672] = 32'b01000111000111001110110011100110;

assign cos\_table[673] = 32'b01000110011101010110100000100111;

assign cos\_table[674] = 32'b01000101110011010011010110001111;

assign cos\_table[675] = 32'b01000101001001000101011010111100;

assign cos\_table[676] = 32'b01000100011110101100110101010000;

assign cos\_table[677] = 32'b01000011110100001001101011101100;

assign cos\_table[678] = 32'b01000011001001011100000100110101;

assign cos\_table[679] = 32'b01000010011110100100000111010000;

assign cos\_table[680] = 32'b01000001110011100001111001100100;

assign cos\_table[681] = 32'b01000001001000010101100010011010;

assign cos\_table[682] = 32'b01000000011100111111001000011101;

assign cos\_table[683] = 32'b00111111110001011110110010010111;

assign cos\_table[684] = 32'b00111111000101110100100110110111;

assign cos\_table[685] = 32'b00111110011010000000101100101100;

assign cos\_table[686] = 32'b00111101101110000011001010100101;

assign cos\_table[687] = 32'b00111101000001111100000111010101;

Продолжение листинга 1.2

assign cos\_table[688] = 32'b00111100010101101011101001110000;

assign cos\_table[689] = 32'b00111011101001010001111000101001;

assign cos\_table[690] = 32'b00111010111100101110111010110111;

assign cos\_table[691] = 32'b00111010010000000010110111010001;

assign cos\_table[692] = 32'b00111001100011001101110100110010;

assign cos\_table[693] = 32'b00111000110110001111111010010011;

assign cos\_table[694] = 32'b00111000001001001001001110110000;

assign cos\_table[695] = 32'b00110111011011111001111001000110;

assign cos\_table[696] = 32'b00110110101110100010000000010011;

assign cos\_table[697] = 32'b00110110000001000001101011011000;

assign cos\_table[698] = 32'b00110101010011011001000001010110;

assign cos\_table[699] = 32'b00110100100101101000001001001111;

assign cos\_table[700] = 32'b00110011110111101111001010000111;

assign cos\_table[701] = 32'b00110011001001101110001011000010;

assign cos\_table[702] = 32'b00110010011011100101010011000111;

assign cos\_table[703] = 32'b00110001101101010100101001011101;

assign cos\_table[704] = 32'b00110000111110111100010101001101;

assign cos\_table[705] = 32'b00110000010000011100011101100000;

assign cos\_table[706] = 32'b00101111100001110101001001100010;

assign cos\_table[707] = 32'b00101110110011000110100000011110;

assign cos\_table[708] = 32'b00101110000100010000101001100001;

assign cos\_table[709] = 32'b00101101010101010011101011111011;

assign cos\_table[710] = 32'b00101100100110001111101110111010;

assign cos\_table[711] = 32'b00101011110111000100111001101111;

assign cos\_table[712] = 32'b00101011000111110011010011101011;

assign cos\_table[713] = 32'b00101010011000011011000100000001;

assign cos\_table[714] = 32'b00101001101000111100010010000100;

assign cos\_table[715] = 32'b00101000111001010111000101001010;

assign cos\_table[716] = 32'b00101000001001101011100100101000;

assign cos\_table[717] = 32'b00100111011001111001110111110100;

assign cos\_table[718] = 32'b00100110101010000010000110000101;

assign cos\_table[719] = 32'b00100101111010000100010110110101;

assign cos\_table[720] = 32'b00100101001010000000110001011101;

assign cos\_table[721] = 32'b00100100011001110111011101010111;

assign cos\_table[722] = 32'b00100011101001101000100001111110;

assign cos\_table[723] = 32'b00100010111001010100000110101110;

assign cos\_table[724] = 32'b00100010001000111010010011000101;

assign cos\_table[725] = 32'b00100001011000011011001110011111;

assign cos\_table[726] = 32'b00100000100111110111000000011100;

assign cos\_table[727] = 32'b00011111110111001101110000011010;

assign cos\_table[728] = 32'b00011111000110011111100101111011;

assign cos\_table[729] = 32'b00011110010101101100101000011110;

assign cos\_table[730] = 32'b00011101100100110100111111100101;

assign cos\_table[731] = 32'b00011100110011111000110010110011;

assign cos\_table[732] = 32'b00011100000010111000001001101010;

assign cos\_table[733] = 32'b00011011010001110011001011101111;

assign cos\_table[734] = 32'b00011010100000101010000000100101;

assign cos\_table[735] = 32'b00011001101111011100101111110010;

assign cos\_table[736] = 32'b00011000111110001011100000111100;

assign cos\_table[737] = 32'b00011000001100110110011011101000;

assign cos\_table[738] = 32'b00010111011011011101100111011110;

assign cos\_table[739] = 32'b00010110101010000001001100000100;

assign cos\_table[740] = 32'b00010101111000100001010001000100;

assign cos\_table[741] = 32'b00010101000110111101111110000101;

assign cos\_table[742] = 32'b00010100010101010111011010110001;

assign cos\_table[743] = 32'b00010011100011101101101110110000;

Продолжение листинга 1.2

assign cos\_table[744] = 32'b00010010110010000001000001101110;

assign cos\_table[745] = 32'b00010010000000010001011011010100;

assign cos\_table[746] = 32'b00010001001110011111000011001110;

assign cos\_table[747] = 32'b00010000011100101010000001000111;

assign cos\_table[748] = 32'b00001111101010110010011100101011;

assign cos\_table[749] = 32'b00001110111000111000011101100101;

assign cos\_table[750] = 32'b00001110000110111100001011100011;

assign cos\_table[751] = 32'b00001101010100111101101110010010;

assign cos\_table[752] = 32'b00001100100010111101001101011110;

assign cos\_table[753] = 32'b00001011110000111010110000110101;

assign cos\_table[754] = 32'b00001010111110110110100000000101;

assign cos\_table[755] = 32'b00001010001100110000100010111100;

assign cos\_table[756] = 32'b00001001011010101001000001001001;

assign cos\_table[757] = 32'b00001000101000100000000010011010;

assign cos\_table[758] = 32'b00000111110110010101101110011110;

assign cos\_table[759] = 32'b00000111000100001010001101000100;

assign cos\_table[760] = 32'b00000110010001111101100101111100;

assign cos\_table[761] = 32'b00000101011111110000000000110100;

assign cos\_table[762] = 32'b00000100101101100001100101011101;

assign cos\_table[763] = 32'b00000011111011010010011011100110;

assign cos\_table[764] = 32'b00000011001001000010101010111110;

assign cos\_table[765] = 32'b00000010010110110010011011010111;

assign cos\_table[766] = 32'b00000001100100100001110100011111;

assign cos\_table[767] = 32'b00000000110010010000111110000111;

assign cos\_table[768] = 32'b00000000000000000000000000000000;

assign cos\_table[769] = 32'b00000000110010010000111110000111;

assign cos\_table[770] = 32'b00000001100100100001110100011111;

assign cos\_table[771] = 32'b00000010010110110010011011010111;

assign cos\_table[772] = 32'b00000011001001000010101010111110;

assign cos\_table[773] = 32'b00000011111011010010011011100110;

assign cos\_table[774] = 32'b00000100101101100001100101011101;

assign cos\_table[775] = 32'b00000101011111110000000000110100;

assign cos\_table[776] = 32'b00000110010001111101100101111100;

assign cos\_table[777] = 32'b00000111000100001010001101000100;

assign cos\_table[778] = 32'b00000111110110010101101110011110;

assign cos\_table[779] = 32'b00001000101000100000000010011010;

assign cos\_table[780] = 32'b00001001011010101001000001001001;

assign cos\_table[781] = 32'b00001010001100110000100010111100;

assign cos\_table[782] = 32'b00001010111110110110100000000101;

assign cos\_table[783] = 32'b00001011110000111010110000110101;

assign cos\_table[784] = 32'b00001100100010111101001101011110;

assign cos\_table[785] = 32'b00001101010100111101101110010010;

assign cos\_table[786] = 32'b00001110000110111100001011100011;

assign cos\_table[787] = 32'b00001110111000111000011101100101;

assign cos\_table[788] = 32'b00001111101010110010011100101011;

assign cos\_table[789] = 32'b00010000011100101010000001000111;

assign cos\_table[790] = 32'b00010001001110011111000011001110;

assign cos\_table[791] = 32'b00010010000000010001011011010100;

assign cos\_table[792] = 32'b00010010110010000001000001101110;

assign cos\_table[793] = 32'b00010011100011101101101110110000;

assign cos\_table[794] = 32'b00010100010101010111011010110001;

assign cos\_table[795] = 32'b00010101000110111101111110000101;

assign cos\_table[796] = 32'b00010101111000100001010001000100;

assign cos\_table[797] = 32'b00010110101010000001001100000100;

assign cos\_table[798] = 32'b00010111011011011101100111011110;

assign cos\_table[799] = 32'b00011000001100110110011011101000;

Продолжение листинга 1.2

assign cos\_table[800] = 32'b00011000111110001011100000111100;

assign cos\_table[801] = 32'b00011001101111011100101111110010;

assign cos\_table[802] = 32'b00011010100000101010000000100101;

assign cos\_table[803] = 32'b00011011010001110011001011101111;

assign cos\_table[804] = 32'b00011100000010111000001001101010;

assign cos\_table[805] = 32'b00011100110011111000110010110011;

assign cos\_table[806] = 32'b00011101100100110100111111100101;

assign cos\_table[807] = 32'b00011110010101101100101000011110;

assign cos\_table[808] = 32'b00011111000110011111100101111011;

assign cos\_table[809] = 32'b00011111110111001101110000011010;

assign cos\_table[810] = 32'b00100000100111110111000000011100;

assign cos\_table[811] = 32'b00100001011000011011001110011111;

assign cos\_table[812] = 32'b00100010001000111010010011000101;

assign cos\_table[813] = 32'b00100010111001010100000110101110;

assign cos\_table[814] = 32'b00100011101001101000100001111110;

assign cos\_table[815] = 32'b00100100011001110111011101010111;

assign cos\_table[816] = 32'b00100101001010000000110001011101;

assign cos\_table[817] = 32'b00100101111010000100010110110101;

assign cos\_table[818] = 32'b00100110101010000010000110000101;

assign cos\_table[819] = 32'b00100111011001111001110111110100;

assign cos\_table[820] = 32'b00101000001001101011100100101000;

assign cos\_table[821] = 32'b00101000111001010111000101001010;

assign cos\_table[822] = 32'b00101001101000111100010010000100;

assign cos\_table[823] = 32'b00101010011000011011000100000001;

assign cos\_table[824] = 32'b00101011000111110011010011101011;

assign cos\_table[825] = 32'b00101011110111000100111001101111;

assign cos\_table[826] = 32'b00101100100110001111101110111010;

assign cos\_table[827] = 32'b00101101010101010011101011111011;

assign cos\_table[828] = 32'b00101110000100010000101001100001;

assign cos\_table[829] = 32'b00101110110011000110100000011110;

assign cos\_table[830] = 32'b00101111100001110101001001100010;

assign cos\_table[831] = 32'b00110000010000011100011101100000;

assign cos\_table[832] = 32'b00110000111110111100010101001101;

assign cos\_table[833] = 32'b00110001101101010100101001011101;

assign cos\_table[834] = 32'b00110010011011100101010011000111;

assign cos\_table[835] = 32'b00110011001001101110001011000010;

assign cos\_table[836] = 32'b00110011110111101111001010000111;

assign cos\_table[837] = 32'b00110100100101101000001001001111;

assign cos\_table[838] = 32'b00110101010011011001000001010110;

assign cos\_table[839] = 32'b00110110000001000001101011011000;

assign cos\_table[840] = 32'b00110110101110100010000000010011;

assign cos\_table[841] = 32'b00110111011011111001111001000110;

assign cos\_table[842] = 32'b00111000001001001001001110110000;

assign cos\_table[843] = 32'b00111000110110001111111010010011;

assign cos\_table[844] = 32'b00111001100011001101110100110010;

assign cos\_table[845] = 32'b00111010010000000010110111010001;

assign cos\_table[846] = 32'b00111010111100101110111010110111;

assign cos\_table[847] = 32'b00111011101001010001111000101001;

assign cos\_table[848] = 32'b00111100010101101011101001110000;

assign cos\_table[849] = 32'b00111101000001111100000111010101;

assign cos\_table[850] = 32'b00111101101110000011001010100101;

assign cos\_table[851] = 32'b00111110011010000000101100101100;

assign cos\_table[852] = 32'b00111111000101110100100110110111;

assign cos\_table[853] = 32'b00111111110001011110110010010111;

assign cos\_table[854] = 32'b01000000011100111111001000011101;

assign cos\_table[855] = 32'b01000001001000010101100010011010;

Продолжение листинга 1.2

assign cos\_table[856] = 32'b01000001110011100001111001100100;

assign cos\_table[857] = 32'b01000010011110100100000111010000;

assign cos\_table[858] = 32'b01000011001001011100000100110101;

assign cos\_table[859] = 32'b01000011110100001001101011101100;

assign cos\_table[860] = 32'b01000100011110101100110101010000;

assign cos\_table[861] = 32'b01000101001001000101011010111100;

assign cos\_table[862] = 32'b01000101110011010011010110001111;

assign cos\_table[863] = 32'b01000110011101010110100000100111;

assign cos\_table[864] = 32'b01000111000111001110110011100110;

assign cos\_table[865] = 32'b01000111110000111100001000101110;

assign cos\_table[866] = 32'b01001000011010011110011001100100;

assign cos\_table[867] = 32'b01001001000011110101011111101110;

assign cos\_table[868] = 32'b01001001101101000001010100110011;

assign cos\_table[869] = 32'b01001010010110000001110010011101;

assign cos\_table[870] = 32'b01001010111110110110110010010111;

assign cos\_table[871] = 32'b01001011100111100000001110001111;

assign cos\_table[872] = 32'b01001100001111111101111111110011;

assign cos\_table[873] = 32'b01001100111000010000000000110100;

assign cos\_table[874] = 32'b01001101100000010110001011000100;

assign cos\_table[875] = 32'b01001110001000010000011000010111;

assign cos\_table[876] = 32'b01001110101111111110100010100100;

assign cos\_table[877] = 32'b01001111010111100000100011100011;

assign cos\_table[878] = 32'b01001111111110110110010101001101;

assign cos\_table[879] = 32'b01010000100101111111110001011110;

assign cos\_table[880] = 32'b01010001001100111100110010010100;

assign cos\_table[881] = 32'b01010001110011101101010001101110;

assign cos\_table[882] = 32'b01010010011010010001001001101110;

assign cos\_table[883] = 32'b01010011000000101000010100010111;

assign cos\_table[884] = 32'b01010011100110110010101011101111;

assign cos\_table[885] = 32'b01010100001100110000001001111101;

assign cos\_table[886] = 32'b01010100110010100000101001001010;

assign cos\_table[887] = 32'b01010101011000000100000011100010;

assign cos\_table[888] = 32'b01010101111101011010010011010010;

assign cos\_table[889] = 32'b01010110100010100011010010101001;

assign cos\_table[890] = 32'b01010111000111011110111011111001;

assign cos\_table[891] = 32'b01010111101100001101001001010110;

assign cos\_table[892] = 32'b01011000010000101101110101010100;

assign cos\_table[893] = 32'b01011000110101000000111010001100;

assign cos\_table[894] = 32'b01011001011001000110010010010111;

assign cos\_table[895] = 32'b01011001111100111101111000010010;

assign cos\_table[896] = 32'b01011010100000100111100110011001;

assign cos\_table[897] = 32'b01011011000100000011010111001111;

assign cos\_table[898] = 32'b01011011100111010001000101010011;

assign cos\_table[899] = 32'b01011100001010010000101011001100;

assign cos\_table[900] = 32'b01011100101101000010000011011111;

assign cos\_table[901] = 32'b01011101001111100101001000110110;

assign cos\_table[902] = 32'b01011101110001111001110101111100;

assign cos\_table[903] = 32'b01011110010100000000000101011101;

assign cos\_table[904] = 32'b01011110110101110111110010001001;

assign cos\_table[905] = 32'b01011111010111100000110110110011;

assign cos\_table[906] = 32'b01011111111000111011001110001101;

assign cos\_table[907] = 32'b01100000011010000110110011001110;

assign cos\_table[908] = 32'b01100000111011000011100000101111;

assign cos\_table[909] = 32'b01100001011011110001010001101011;

assign cos\_table[910] = 32'b01100001111100010000000000111110;

assign cos\_table[911] = 32'b01100010011100011111101001101001;

Продолжение листинга 1.2

assign cos\_table[912] = 32'b01100010111100100000000110101100;

assign cos\_table[913] = 32'b01100011011100010001010011001100;

assign cos\_table[914] = 32'b01100011111011110011001010001111;

assign cos\_table[915] = 32'b01100100011011000101100110111111;

assign cos\_table[916] = 32'b01100100111010001000100100100110;

assign cos\_table[917] = 32'b01100101011000111011111110010010;

assign cos\_table[918] = 32'b01100101110111011111101111010011;

assign cos\_table[919] = 32'b01100110010101110011110010111011;

assign cos\_table[920] = 32'b01100110110011111000000100011111;

assign cos\_table[921] = 32'b01100111010001101100011111010111;

assign cos\_table[922] = 32'b01100111101111010000111110111100;

assign cos\_table[923] = 32'b01101000001100100101011110101010;

assign cos\_table[924] = 32'b01101000101001101001111010000001;

assign cos\_table[925] = 32'b01101001000110011110001100100000;

assign cos\_table[926] = 32'b01101001100011000010010001101100;

assign cos\_table[927] = 32'b01101001111111010110000101001010;

assign cos\_table[928] = 32'b01101010011011011001100010100100;

assign cos\_table[929] = 32'b01101010110111001100100101100100;

assign cos\_table[930] = 32'b01101011010010101111001001111000;

assign cos\_table[931] = 32'b01101011101110000001001011010000;

assign cos\_table[932] = 32'b01101100001001000010100101100000;

assign cos\_table[933] = 32'b01101100100011110011010100011100;

assign cos\_table[934] = 32'b01101100111110010011010011111011;

assign cos\_table[935] = 32'b01101101011000100010011111111010;

assign cos\_table[936] = 32'b01101101110010100000110100010100;

assign cos\_table[937] = 32'b01101110001100001110001101001001;

assign cos\_table[938] = 32'b01101110100101101010100110011100;

assign cos\_table[939] = 32'b01101110111110110101111100010010;

assign cos\_table[940] = 32'b01101111010111110000001010110001;

assign cos\_table[941] = 32'b01101111110000011001001110000101;

assign cos\_table[942] = 32'b01110000001000110001000010011001;

assign cos\_table[943] = 32'b01110000100000110111100011111110;

assign cos\_table[944] = 32'b01110000111000101100101111000110;

assign cos\_table[945] = 32'b01110001010000010000100000000100;

assign cos\_table[946] = 32'b01110001100111100010110011010010;

assign cos\_table[947] = 32'b01110001111110100011100101001000;

assign cos\_table[948] = 32'b01110010010101010010110010000100;

assign cos\_table[949] = 32'b01110010101011110000010110100110;

assign cos\_table[950] = 32'b01110011000001111100001111001111;

assign cos\_table[951] = 32'b01110011010111110110011000100110;

assign cos\_table[952] = 32'b01110011101101011110101111010000;

assign cos\_table[953] = 32'b01110100000010110101001111111010;

assign cos\_table[954] = 32'b01110100010111111001110111010000;

assign cos\_table[955] = 32'b01110100101100101100100010000011;

assign cos\_table[956] = 32'b01110101000001001101001101000101;

assign cos\_table[957] = 32'b01110101010101011011110101001011;

assign cos\_table[958] = 32'b01110101101001011000010111001111;

assign cos\_table[959] = 32'b01110101111101000010110000001010;

assign cos\_table[960] = 32'b01110110010000011010111100111100;

assign cos\_table[961] = 32'b01110110100011100000111010100101;

assign cos\_table[962] = 32'b01110110110110010100100110001000;

assign cos\_table[963] = 32'b01110111001000110101111100101101;

assign cos\_table[964] = 32'b01110111011011000100111011011011;

assign cos\_table[965] = 32'b01110111101101000001011111011111;

assign cos\_table[966] = 32'b01110111111110101011100110001000;

assign cos\_table[967] = 32'b01111000010000000011001100101000;

Продолжение листинга 1.2

assign cos\_table[968] = 32'b01111000100001001000010000010011;

assign cos\_table[969] = 32'b01111000110001111010101110100001;

assign cos\_table[970] = 32'b01111001000010011010100100101100;

assign cos\_table[971] = 32'b01111001010010100111110000010001;

assign cos\_table[972] = 32'b01111001100010100010001110110001;

assign cos\_table[973] = 32'b01111001110010001001111101101101;

assign cos\_table[974] = 32'b01111010000001011110111010101101;

assign cos\_table[975] = 32'b01111010010000100001000011011000;

assign cos\_table[976] = 32'b01111010011111010000010101011011;

assign cos\_table[977] = 32'b01111010101101101100101110100011;

assign cos\_table[978] = 32'b01111010111011110110001100100011;

assign cos\_table[979] = 32'b01111011001001101100101101001111;

assign cos\_table[980] = 32'b01111011010111010000001110011101;

assign cos\_table[981] = 32'b01111011100100100000101110001001;

assign cos\_table[982] = 32'b01111011110001011110001010001111;

assign cos\_table[983] = 32'b01111011111110001000100000110000;

assign cos\_table[984] = 32'b01111100001010011111101111101110;

assign cos\_table[985] = 32'b01111100010110100011110101001111;

assign cos\_table[986] = 32'b01111100100010010100101111011101;

assign cos\_table[987] = 32'b01111100101101110010011100100100;

assign cos\_table[988] = 32'b01111100111000111100111010110001;

assign cos\_table[989] = 32'b01111101000011110100001000010111;

assign cos\_table[990] = 32'b01111101001110011000000011101100;

assign cos\_table[991] = 32'b01111101011000101000101011000101;

assign cos\_table[992] = 32'b01111101100010100101111100111111;

assign cos\_table[993] = 32'b01111101101100001111110111110111;

assign cos\_table[994] = 32'b01111101110101100110011010001110;

assign cos\_table[995] = 32'b01111101111110101001100010100111;

assign cos\_table[996] = 32'b01111110000111011001001111101001;

assign cos\_table[997] = 32'b01111110001111110101011111111110;

assign cos\_table[998] = 32'b01111110010111111110010010010011;

assign cos\_table[999] = 32'b01111110011111110011100101010110;

assign cos\_table[1000] = 32'b01111110100111010101010111111100;

assign cos\_table[1001] = 32'b01111110101110100011101000111001;

assign cos\_table[1002] = 32'b01111110110101011110010111000110;

assign cos\_table[1003] = 32'b01111110111100000101100001011111;

assign cos\_table[1004] = 32'b01111111000010011001000111000011;

assign cos\_table[1005] = 32'b01111111001000011001000110110011;

assign cos\_table[1006] = 32'b01111111001110000101011111110101;

assign cos\_table[1007] = 32'b01111111010011011110010001010000;

assign cos\_table[1008] = 32'b01111111011000100011011010001111;

assign cos\_table[1009] = 32'b01111111011101010100111001111111;

assign cos\_table[1010] = 32'b01111111100001110010101111110010;

assign cos\_table[1011] = 32'b01111111100101111100111010111100;

assign cos\_table[1012] = 32'b01111111101001110011011010110100;

assign cos\_table[1013] = 32'b01111111101101010110001110110010;

assign cos\_table[1014] = 32'b01111111110000100101010110010110;

assign cos\_table[1015] = 32'b01111111110011100000110000111110;

assign cos\_table[1016] = 32'b01111111110110001000011110001101;

assign cos\_table[1017] = 32'b01111111111000011100011101101011;

assign cos\_table[1018] = 32'b01111111111010011100101110111111;

assign cos\_table[1019] = 32'b01111111111100001001010001110111;

assign cos\_table[1020] = 32'b01111111111101100010000110000010;

assign cos\_table[1021] = 32'b01111111111110100111001011010001;

assign cos\_table[1022] = 32'b01111111111111011000100001011010;

assign cos\_table[1023] = 32'b01111111111111110110001000010110;

Далее опишем модуль trig\_table. VALUE\_WIDTH определяет разрядность выходных значений синуса и косинуса. ANGLE\_WIDTH указывает на разрядность входного угла angle\_in. COUNT определяет общее количество значений в таблицах синуса и косинуса.

Вход angle\_in —угол, для которого требуется вычислить синус и косинус. Выходы sin\_out и cos\_out представляют собой выходные значения синуса и косинуса для входного угла.

sin\_cond и cos\_cond используются для определения знака результата в зависимости от четверти, в котором находится угол (исходя из его значения).

sin\_cond проверяет, находится ли угол в первом или втором квадранте, где синус положительный.

cos\_cond проверяет, находится ли угол в первом или четвёртом квадранте, где косинус положительный (Листинг 1.3).

Листинг 1.3 – Модуль генерации значения синуса и косинуса из предварительно вычисленных таблиц на языке Verilog

module trig\_table #(

VALUE\_WIDTH = 32,

ANGLE\_WIDTH = 10,

COUNT = 2\*\*ANGLE\_WIDTH)

( input [ANGLE\_WIDTH-1:0] angle\_in,

output signed [VALUE\_WIDTH-1:0] sin\_out,

output signed [VALUE\_WIDTH-1:0] cos\_out

);

wire [VALUE\_WIDTH-1:0] sin\_table [0:COUNT-1];

`include "sin\_table.vh"

wire [VALUE\_WIDTH-1:0] cos\_table [0:COUNT-1];

`include "cos\_table.vh"

wire sin\_cond = angle\_in >= 0 && angle\_in < COUNT/2;

wire cos\_cond = (angle\_in >= 0 && angle\_in < COUNT/4) || (angle\_in >= 3\*COUNT/4 && angle\_in < COUNT);

assign sin\_out = sin\_cond ? sin\_table[angle\_in] : -sin\_table[angle\_in];

assign cos\_out = cos\_cond ? cos\_table[angle\_in] : -cos\_table[angle\_in];

endmodule

* 1. Задание 2

Разработаем RTL-модель устройства на Verilog HDL для синтеза функций sin(x) и cos(x) с помощью рядов Тейлора, произвести верификацию устройства.

Опишем модуль, который содержит две функции real\_sin и real\_cos. Они вычисляют косинус и синус по разложению в ряд Тейлора для приближенного вычисления значений тригонометрических функций (Листинг 1.3).

Листинг 1.3 – Модуль вычисления косинуса и синуса по разложению в ряд Тейлора на языке Verilog

function automatic real real\_sin;

input real x;

real sign, x\_loc, sum;

begin

sign = 1.0;

x\_loc = x;

if(x < 0)

begin

x\_loc = -x;

sign = -1.0;

end

while (x\_loc > 3.14159265/2.0)

begin

x\_loc = x\_loc - 3.14159265;

sign = -1.0 \* sign;

end

sum = x\_loc - (x\_loc\*\*3)/6 + (x\_loc\*\*5)/120 - (x\_loc\*\*7)/5040 + (x\_loc\*\*9)/362880 - (x\_loc\*\*11)/39916800;

real\_sin = sign \* sum;

end

endfunction

function automatic real real\_cos;

input real x;

real sign, x\_loc, sum;

begin

sign = 1.0;

x\_loc = x;

if(x < 0)

begin

x\_loc = -x;

end

while (x\_loc > 3.14159265)

begin

x\_loc = x\_loc - 3.14159265;

sign = -1.0 \* sign;

end

Продолжение листинга 1.3

sum = 1 - (x\_loc\*\*2)/2 + (x\_loc\*\*4)/24 - (x\_loc\*\*6)/720 + (x\_loc\*\*8)/40320 - (x\_loc\*\*10)/3628800;

real\_cos = sign \* sum;

end

endfunction

* 1. Задание 3

Разработаем RTL-модель устройства на Verilog HDL для синтеза функций sin(x) и cos(x) с помощью алгоритмов CORDIC.

CORDIC использует итеративные сдвиги и сложения для приближенного вычисления тригонометрических функций. В каждом шаге алгоритма вектор поворачивается влево или вправо на фиксированный угол, определенный заранее. Углы предварительно сохраняются в таблице atan\_table, которая содержит арктангенсы (atan) соответствующих углов (Листинги 1.4, 1.5).

Листинг 1.4 – Заголовочный файл таблицы арктангенсов для необходимых углов

assign atan\_table[00] = 32'b00100000000000000000000000000000; // atan(2^0) -> pi/4

assign atan\_table[01] = 32'b00010010111001000000010100011101; // atan(2^-1) -> pi/8

assign atan\_table[02] = 32'b00001001111110110011100001011011; // atan(2^-2) -> pi/16

assign atan\_table[03] = 32'b00000101000100010001000111010100; // atan(2^-3) -> pi/32

assign atan\_table[04] = 32'b00000010100010110000110101000011; // atan(2^-4)

assign atan\_table[05] = 32'b00000001010001011101011111100001; // atan(2^-5)

assign atan\_table[06] = 32'b00000000101000101111011000011110; // atan(2^-6)

assign atan\_table[07] = 32'b00000000010100010111110001010101; // atan(2^-7)

assign atan\_table[08] = 32'b00000000001010001011111001010011; // atan(2^-8)

assign atan\_table[09] = 32'b00000000000101000101111100101110; // atan(2^-9)

assign atan\_table[10] = 32'b00000000000010100010111110011000; // atan(2^-10)

assign atan\_table[11] = 32'b00000000000001010001011111001100; // atan(2^-11)

assign atan\_table[12] = 32'b00000000000000101000101111100110; // atan(2^-12)

assign atan\_table[13] = 32'b00000000000000010100010111110011; // atan(2^-13)

assign atan\_table[14] = 32'b00000000000000001010001011111001; // atan(2^-14)

Продолжение листинга 1.4

assign atan\_table[15] = 32'b00000000000000000101000101111101; // atan(2^-15)

assign atan\_table[16] = 32'b00000000000000000010100010111110; // atan(2^-16)

assign atan\_table[17] = 32'b00000000000000000001010001011111; // atan(2^-17)

assign atan\_table[18] = 32'b00000000000000000000101000101111; // atan(2^-18)

assign atan\_table[19] = 32'b00000000000000000000010100011000; // atan(2^-19)

assign atan\_table[20] = 32'b00000000000000000000001010001100; // atan(2^-20)

assign atan\_table[21] = 32'b00000000000000000000000101000110; // atan(2^-21)

assign atan\_table[22] = 32'b00000000000000000000000010100011; // atan(2^-22)

assign atan\_table[23] = 32'b00000000000000000000000001010001; // atan(2^-23)

assign atan\_table[24] = 32'b00000000000000000000000000101000; // atan(2^-24)

assign atan\_table[25] = 32'b00000000000000000000000000010100; // atan(2^-25)

assign atan\_table[26] = 32'b00000000000000000000000000001010; // atan(2^-26)

assign atan\_table[27] = 32'b00000000000000000000000000000101; // atan(2^-27)

assign atan\_table[28] = 32'b00000000000000000000000000000010; // atan(2^-28)

assign atan\_table[29] = 32'b00000000000000000000000000000001; // atan(2^-29)

assign atan\_table[30] = 32'b00000000000000000000000000000000; // atan(2^-30)

Листинг 1.5 – Модуль вычисления синусов и косинусов через алгоритм CORDIC на языке Verilog

module CORDIC

(

input clk,

input [31:0] angle,

input [15:0] Xin, Yin,

output [16:0] COS\_OUT, SIN\_OUT

);

wire [31:0] atan\_table [0:30];

`include "atan\_table.vh"

reg signed [31:0] X [0:31];

reg signed [31:0] Y [0:31];

reg signed [31:0] RES\_ACC [0:31];

wire [1:0] quadrant = angle[31:30];

always@(posedge clk)

begin

case(quadrant)

2'b00, 2'b11:

Продолжение листинга 1.5

begin

RES\_ACC[0] <= angle;

X[0] <= Xin;

Y[0] <= Yin;

end

2'b01:

begin

X[0] <= -Yin;

Y[0] <= Xin;

RES\_ACC[0] <= {2'b00, angle[29:0]};

end

2'b10:

begin

X[0] <= Yin;

Y[0] <= -Xin;

RES\_ACC[0] <= {2'b11, angle[29:0]};

end

endcase

end

genvar i;

generate

for(i = 0; i < 31; i = i + 1)

begin

wire rotation\_sign = RES\_ACC[i][31];

wire signed [16:0] X\_shift = X[i] >>> i;

wire signed [16:0] Y\_shift = Y[i] >>> i;

always@(posedge clk)

begin

X[i+1] <= rotation\_sign ? X[i] + Y\_shift: X[i] - Y\_shift;

Y[i+1] <= rotation\_sign ? Y[i] - X\_shift: Y[i] + X\_shift;

RES\_ACC[i+1] <= rotation\_sign ? RES\_ACC[i] + atan\_table[i] : RES\_ACC[i] - atan\_table[i];

end

end

endgenerate

assign SIN\_OUT = Y[31];

assign COS\_OUT = X[31];

endmodule

Далее произведём верификацию (тестбенч) устройства. Для этого напишем модуль COMPARE\_TEST\_TRIG для сравнения результатов вычисления синуса и косинуса, полученных разными методами: таблицы значений, методом Тейлора, с использованием алгоритма CORDIC и IP-блока CORDIC (Листинг 1.6).

Листинг 1.6 – Модуль тестирования на языке Verilog

module COMPARE\_TEST\_TRIG;

localparam pi = 3.14159265;

`include "tailor.v"

reg [63:0] real\_sin\_out, real\_sin\_res\_bits;

wire [10:0] real\_sin\_exp = real\_sin\_res\_bits[62-:11];

real real\_sin\_res, real\_sin\_i;

initial

begin

real\_sin\_i = 0;

while(1)

begin

real\_sin\_res = real\_sin(real\_sin\_i);

real\_sin\_res\_bits = $realtobits(real\_sin\_res);

real\_sin\_out = $rtoi(real\_sin(real\_sin\_i) \* 2.0\*\*$signed(real\_sin\_exp - 1023 + 15));

#10;

real\_sin\_i = real\_sin\_i + 3.14159265/180;

end

end

reg [63:0] real\_cos\_out, real\_cos\_res\_bits;

wire [10:0] real\_cos\_exp = real\_cos\_res\_bits[62-:11];

real real\_cos\_res, real\_cos\_i;

initial

begin

real\_cos\_i = 0;

while(1)

begin

real\_cos\_res = real\_cos(real\_cos\_i);

real\_cos\_res\_bits = $realtobits(real\_cos\_res);

real\_cos\_out = $rtoi(real\_cos(real\_cos\_i) \* 2.0\*\*$signed(real\_cos\_exp - 1023 + 15));

#10;

real\_cos\_i = real\_cos\_i + pi/180;

end

end

reg [63:0] i;

initial i = 0;

reg [31:0] cordic\_angle;

reg [9:0] trig\_table\_angle;

always

begin

trig\_table\_angle = ((1 << 10)\*i)/360;

cordic\_angle = ((1 << 32)\*i)/360;

#10;

i = i + 1;

end

reg clk;

initial clk = 0;

always #5 clk <= ~clk;

reg [15:0] Xin, Yin;

wire [16:0] Xout, Yout, cos\_cordic, sin\_cordic;

initial

begin

Xin = 32000/1.647;

Yin = 0;

end

CORDIC uut1 (

.clk(clk),

.angle(cordic\_angle),

.Xin(Xin),

.Yin(Yin),

.COS\_OUT(Xout),

.SIN\_OUT(Yout)

);

assign cos\_cordic = Xout;

assign sin\_cordic = Yout;

localparam TABLE\_VALUE\_WIDTH = 33;

localparam TABLE\_ANGLE\_WIDTH = 10;

wire [TABLE\_VALUE\_WIDTH-1:0] trig\_table\_sin;

wire [TABLE\_VALUE\_WIDTH-1:0] trig\_table\_cos;

trig\_table #(

.VALUE\_WIDTH(TABLE\_VALUE\_WIDTH),

.ANGLE\_WIDTH(TABLE\_ANGLE\_WIDTH)

) uut

(

.angle\_in(trig\_table\_angle),

.sin\_out(trig\_table\_sin),

.cos\_out(trig\_table\_cos)

);

wire ip\_valid\_out;

wire [31:0] sin\_ip\_out, cos\_ip\_out;

reg [31:0] ip\_cordic\_angle;

real r\_ip\_cordic\_angle;

initial

begin

r\_ip\_cordic\_angle = 0;

ip\_cordic\_angle = 0;

@(posedge clk)

while(1)

begin

@(posedge clk)

r\_ip\_cordic\_angle = r\_ip\_cordic\_angle + pi/180;

if (r\_ip\_cordic\_angle > pi)

r\_ip\_cordic\_angle = -pi;

ip\_cordic\_angle = $rtoi(r\_ip\_cordic\_angle \* (2.0\*\*29));

end

end

cordic\_0 u\_ip (

.s\_axis\_phase\_tdata(ip\_cordic\_angle),

.s\_axis\_phase\_tvalid(1'b1),

.aclk(clk),

.m\_axis\_dout\_tdata({sin\_ip\_out, cos\_ip\_out}),

.m\_axis\_dout\_tvalid(ip\_valid\_out)

);

endmodule

Рассмотрим временную диаграмму сигналов, используемых для сравнения результатов вычислений синуса и косинуса разными методами.

real\_sin\_out и real\_cos\_out представляют значения синуса и косинуса, полученные с помощью ряда Тейлора.

Xout и Yout значения полученные в результате алгоритма CORDIC.

trig\_table\_sin и trig\_table\_cos получены из таблицы значений синуса и косинуса.

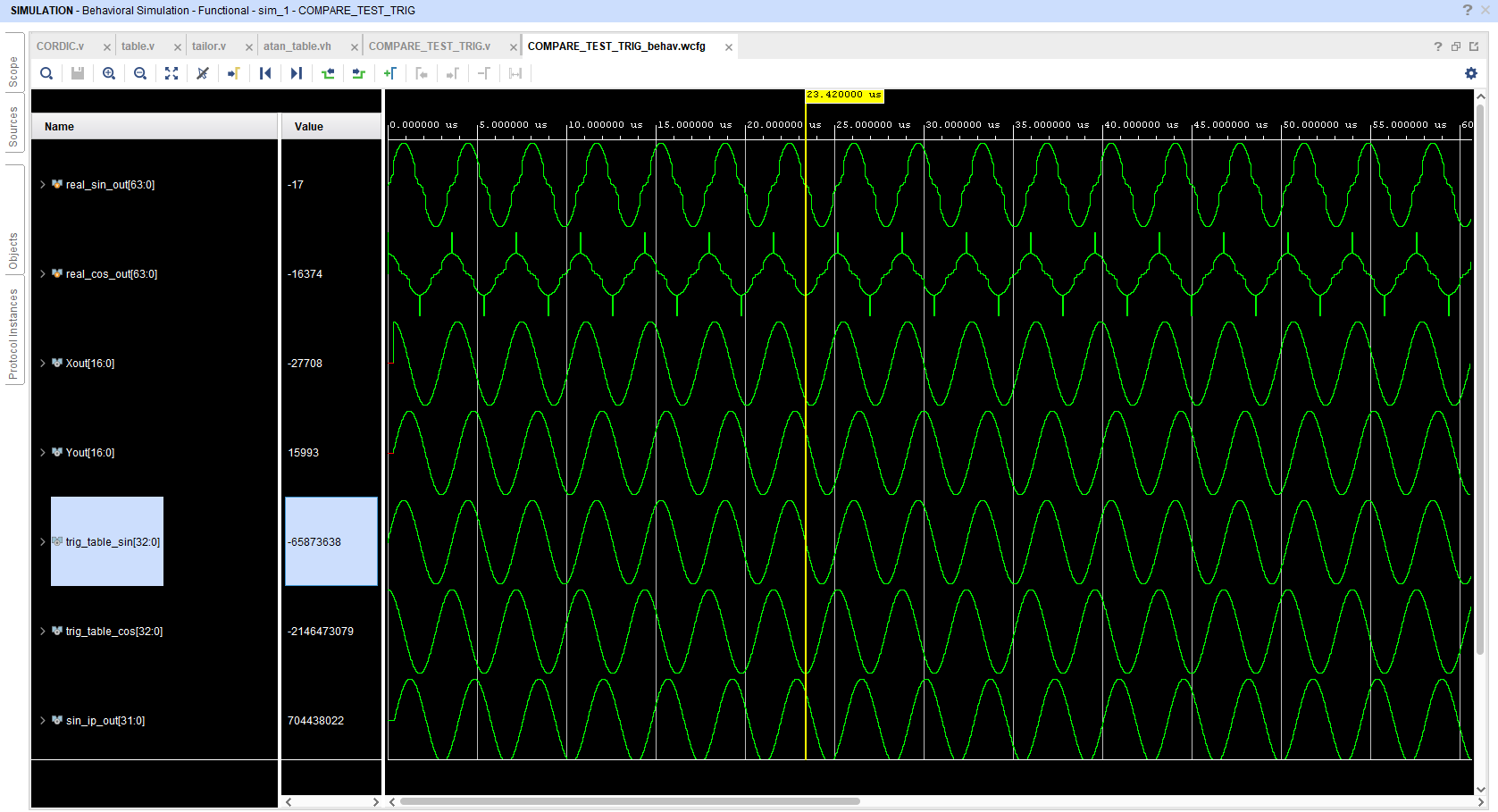
sin\_ip\_out и cos\_ip\_out получены из IP-ядра CORDIC (Рисунок 1.1)

Рисунок 1.1 – Временная диаграмма тестового модуля

ЗАКЛЮЧЕНИЕ

В рамках данной практической работы спроектировали различные вычислительные устройства на уровне регистровых передач (RTL) для синтеза сигналов трансцендентных функций. Применяя методы и алгоритмы расчёта значений трансцендентных функций, а также язык описания аппаратуры Verilog, разработали RTL-модели вычислительных устройств для синтеза сигналов трансцендентных функций.

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