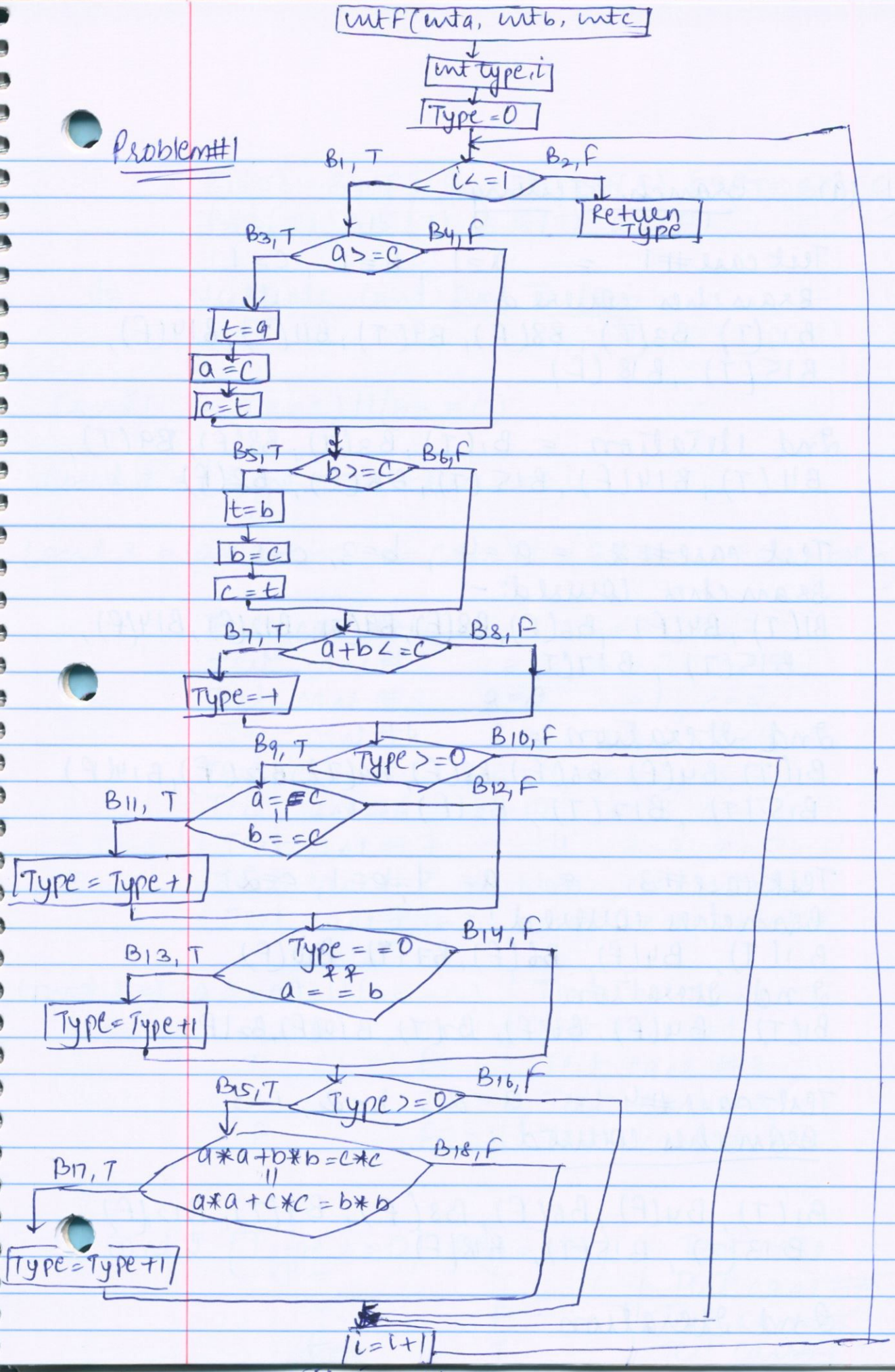
Problem#1


int f(int a, int b, int c
int type, i
Type = 0
B1, T
i<=1
B2, f
Return Type
B3, T
a>=c
B4, f
t=a
a=c
c=t
B5, T
b>=c
B6, f
t=b
b=c
c=t
B7, T
a+b<=c
B8, f
Type=1
B9, T
Type>=0
B10, f
B11, T
a==c
b==c
B12, f
Type = Type+1
B13, T
Type==0
a==b
B14, f
Type=Type+1
B15, T
Type>=0
B16, f
B17, T
a*a+b*b=c*c
a*a+c*c=b*b
B18, f
Type=Type+1
i=i+1

Q-1 (a) Branch Testing

Test case #1 = a=1, b=1, c=1
Branches covered
B1,(T) B3(T), B8(F), B9(T), B11(T), B14(F),
B15(T), B18(F)

2nd Iteration = B1(T), B3(T), B8(F), B9(T),
B11(T), B14(F), B15(T), B18(F), B2(F)

Test case #2 = a=4, b=3, c=5
Branches covered:-
B1(T), B4(F), B6(F), B8(F), B9(T), B12(F), B14(F),
B15(T), B17(T)

2nd Iteration =
B1(T), B4(F) B6(F), B8(F), B9(T), B12(F), B14(F)
B15(T), B17(T), B2(F)

Test case #3 = a=1, b=1, c=2
Branches covered:-
B1(T), B4(F), B6(F), B7(T), B10(F)
2nd Iteration
B1(T), B4(F), B6(f), B7(T), B10(F), B2(F)

Test case #4 = a=2, b=2, c=3
Branches covered:-

B1(T), B4(F), B6(F), B8(F), B9(T), B12(F)
B13(T), B15(T), B18(F)

2nd Iteration

B1(T), B4(F), B6(F), B8(F), B9(T), B12(F),
B13(T), B15(T), B18(T), B2(F)

(b) Multiple condition Testing

Cond1 = (a==c) || (b==c)

Cond2 = (type==0) && (a==b)

Cond3 = (a*a + b*b == c*c) || (a*a + c*c == b*b)

Test case #1 a=3, b=3, c=3
Test case #2 a=1, b=2, c=2
Test case #3 a=2, b=1, c=2
Test case #4 a=2 b=3 c=4
Test case #5 a=4, b=4, c=5
Test case #6 a=12, b=13, c=15
Test case #7 a=4, b=3, c=5
Test case #8 = Non executable
Test case #9 = non executable

Cond1 => (a==c) || (b==c)		Test case
T	T	Test case #1
T	f	Test case #3
f	T	Test case #2
f	f	Test case #4

Cond2 (Type==0) && (a==b)		Test case
T	T	Test case #5
T	f	Test case #6
f	T	Test case #1

(Type==0)	&&	(a==b)	Test case
F		F	Test case#3

Cond-3	(a*a + b*b == c*c)	||	a*a + c*c == b*b	Test case
	T		T	Test case#8
	T		F	Test case#7
	F		T	Test case#9
	f		f	Test case#1

Problem#2

(a) Data Flow Testing

Variables & type

Variable c :- Def = 1, 8, 12 Use = 5, 7, 9, 11, 13, 16, 21
1→5, 1→7, 1→9, 1→11, 1→13, 1→16, 1→21, 8→9, 8→11, 8→13, 8→16, 8→21, 8→5, 8→7, 12→13, 12→16, 12→21, 12→5, 12→7, 12→9, 12→11, 12→13, 12→16, 12→21

variable type Def = 2, 14, 17, 19, 22 Use = 15, 17, 18, 19, 20, 22, 24
2→15, 2→17, 2→18, 2→19, 2→20, 2→22, 2→24, 14→15, 14→24, 17→17, 17→18, 17→20, 17→15, 19→20, 19→18, 19→24, 19→15, 22→22, 22→24, 22→15, 22→18, 22→20, 22→22, 22→24

(ii) Test cases:-

Problem#2 (ii)

(b) Def-Use Pairs for variable c

Test#1 a=1, b=1, c=1
1→5, 1→7, 8→9, 8→11, 12→13, 12→16, 12→21, 12→5, ~~12→11~~
12→17,

Testcase#2 a=1, b=2, c=2
1→5, 1→9, 1→11, 12→13, 12→16, 12→21, 12→5, 12→~~9~~11
12→11

Testcase#3 a=2, b=1, c=2
8→9, 8→13, 8→16, 8→21, 8→5, 8→7

Testcase4 a=2 b=3 c=4
1→5, 1→9, 1→13, 1→16, 1→21

Def-use Pairs for variable type

Test case#1 a=1, b=1, c=1
2→15, 2→17, 17→17, 17→18, 17→20, 17→15, 17→24

Testcase#2 a=1, b=2, c=2
2→15, 2→17

Testcase#3 a=2, b=1, c=2 ; No Def-Use pairs for variable type for this test case

Test case#4 a=2, b=3, c=4
2→15, 2→18, 2→20, 2→22

Testcase#5 a=4, b=6, c=7

2→15, 2→18, 2→20, 2→24

Test case# ~~Test case~~ 6 a=1, b=1, c=2
14→15, 14→24

Testcase#7 a=4, b=4, c=5
2→15, 2→18, 2→19, 19→20, 19→15, 19→24, 19→18

Testcase#8 a=4, b=3 c=5
22→22, 22→15, 22→18, 22→20, 22→24

Non executable defination pairs
14→17, 14→18, 14→19, 14→20, 14→22, 17→19, 17→22
19→17, 19→19, 19→22, 22→17

Problem#3

(a) State S0
Incoming = T1, T4, T7, T9, T11
Outgoing = T2
Transition pairs = (T1, T2), (T4, T2), (T7, T2), (T9, T2), (T11 ÷ T2)

State S1
Incoming = T2
Outgoing = T3, T5
Transition-pairs = (T2, T3), (T2, T5)

State S2
Incoming = T3
Outgoing = T4, T6
Transition-pairs = (T3, T4), (T3, T6)

State S3
Incoming = T5, T6
Outgoing = T7, T10
Transition pairs = (T5, T7), (T5, T10), (T6, T7) (T6, T10)

State S4
Incoming = T8, T10
Outgoing = T8, T9, T11
Transition pairs = (T8, T8), (T8, T9), (T8, T11), (T10, T8), (T10, T9), (T10, T11)

Test case#1 = Activate(5), Start(), Credit(), Approved(), StartPump(), PumpGallon(), Stop()
Transition Pairs = (T1, T2), (T2, T3), (T3, T6), (T6, T10), (T10, T8), (T8, T11)

Test case#2 = Activate(4), Start(), Cash(5), StartPump(), PumpGallon(), Stop(), Start(), Credit(), Reject()
Transition Pairs = (T2, T5), (T5, T10), (T8, T9)

Test case#3 Activate(10), Start(), Credit(), Approved(), StartPump(), PumpGallon(), Stop(), Start(), Credit(), Reject()
Transition Pairs = (T11, T12), (T3, T4)

Test case#4 Activate(4), Start(), Cash(5), Cancel(), Start(), Credit(), Approved, Cancel()
Transition pairs = (T9, T2), (T4, T2)

Test case#5 Activate(4), Start(), Cash(5), Cancel(), Start(), Credit(), Approved, Cancel()
Transition pairs = (T5, T7), (T6, T7), (T7, T2)

Test case #6 = Activate(5), Start(), Credit(), Approved(), StartPump(), PumpGallon(), PumpGallon(), Stop()
Transition pairs = (T8, T8)

Test case #7 Activate(5), Start(), Cash(5), StartPump(), Stop()
Transition pairs = (T10, T11)

Test case #8 = Activate(5), Start(), Cash(5), StartPump(), Stop()
Transition Pairs = (T10, T11)

Problem #3

(b) E1 = Activate(int a)
E2 = Start()
E3 = Credit()
E4 = Reject()
E5 = Cancel()
E6 = Approved()
E7 = Cash(int c)
E8 = StartPump()
E9 = PumpGallon()
E10 = Stop()

For SO = 9 default transition
State SO = Activate(int a), Credit(), Reject(), Cancel(), Approved(), Cash(int c), StartPump(), PumpGallon(), Stop()

Test case #1 Activate(4), Credit(), Reject(), Cancel(), Approved(), Cash(5), StartPump(), PumpGallon(), Stop()

For S1 = 9 default transitions
State "S1" = Activate(int a), Start(), Reject(), Cancel(), Approved(), Cash(c) [c<=0], StartPump(), PumpGallon(), Stop()

Testcase# 2 Activate(int a), Start(), Reject(), Approved() Cash(0), StartPump(), Cancel(), PumpGallon(), Stop()

For S2 = 8 default transitions
State S2 = Activate(int a), Start(), Credit(), Cancel(), Cash(c)[c>0], StartPump(), PumpGallon(), Stop()

Testcase#3 Activate(4), Start(), Credit(), StartPump(), PumpGallon(), Stop(), Cancel(), Cash(5)

For S3 = 8 default transitions
State S3 = Activate(int a), Start(), Credit(), Approved(), Reject(), Cash(c)[c<=0], PumpGallon(), Stop()

Test case#4 Activate(4), Start(), Credit(), Approved(), PumpGallon(), Cash(5), Reject(), Stop()

For S4 = 9 default transitions
State S4 = Activate(int a), Start(), Cash(c)[c>0], StartPump(), Credit(), Approved(), Reject(), Cancel(), PumpGallon()[w==0 && cash == price*(G+1))]

Testcase#5 = Activate(4), Start(), Cash(4), StartPump(), Credit(), Approved(), PumpGallon(), Cancel(), Reject()

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