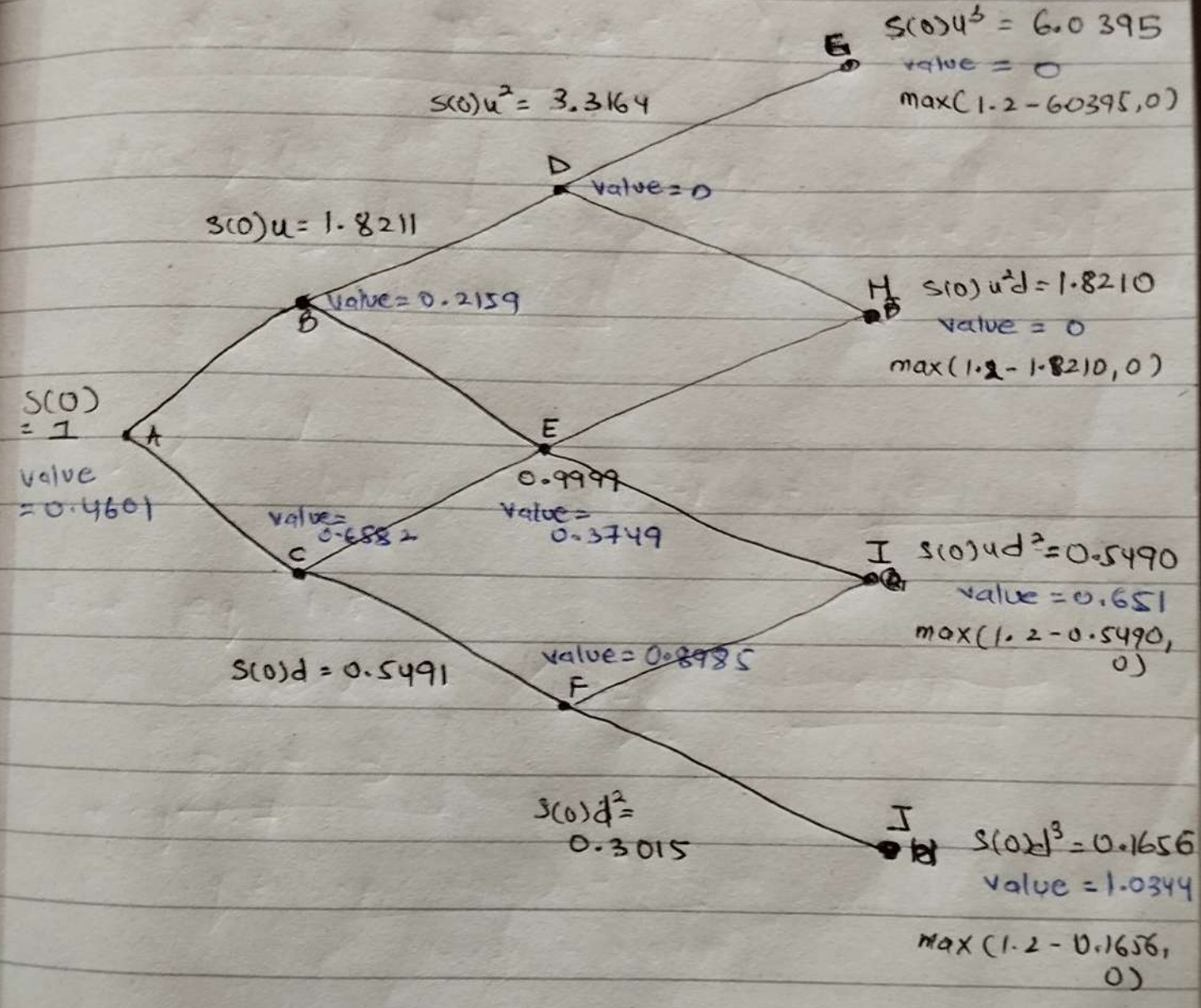
S(0)u³ = 6.0395
value = 0
max(1.2 - 6.0395, 0)
G
S(0)u² = 3.3164
D
value = 0
S(0)u = 1.8211
B
value = 0.2159
H
S(0)u²d = 1.8210
value = 0
max(1.2 - 1.8210, 0)
S(0) = 1
A
value = 0.4601
E
0.9999
value = 0.6882
value = 0.3749
C
I
S(0)ud² = 0.5490
value = 0.651
max(1.2 - 0.5490, 0)
S(0)d = 0.5491
value = 0.8985
F
S(0)d² = 0.3015
J
S(0)d³ = 0.1656
value = 1.0344
max(1.2 - 0.1656, 0)
t = 0
t = 1
t = 2
t = 3

(i) calculating values at the leaf node

Node G = max(1.2 - 6.0395, 0) = 0

Node H = max(1.2 - 1.8210, 0) = 0

Node I = max(1.2 - 0.5490, 0) = 0.651

Node J = max(1.2 - 0.1656, 0) = 1.0344

(ii) Values at child nodes

Node D = $e^{-0.05}$ [0.3948 . 0 + 0.6052 . 0]
= 0

Node E = $e^{-0.05}$ [0.3948 . 0 + 0.6054 . 0.651]
= 0.3749

max(0.3749, 1.2 - 0.9999) = 0.3749.
we don't exercise!

Node F = $e^{-0.05}$ [0.3948 . 0.651 + 0.6054 . 1.0344)
= 0.8402

max(0.8402, 1.2 - 0.3015)
max(0.8402, 0.8985) = 0.8985
we exercise.

Node B = $e^{-0.05}$ [0.3948 . 0 + 0.6054 . 0.3749]

= 0.2159

max (0.2159, 1.2 - 1.8211) = 0.2159

we dont exercise.

Node C = $e^{-0.05}$ [0.3948 . 0.3749 + 0.6054 . 0.8985]

= 0.6582

max (0.6582, 1.2 - 0.5491)

max (0.6582, 0.6509) = 0.6582

we dont exercise.

(iii) Valve of root node

A = $e^{-0.05}$ (0.3948 . 0.2159 + 0.6054 . 0.6582)

= 0.4601

max (0.4601, 1.2 - 1) = 0.4601.

we dont exercise.

(b) Replicating portfolio : using eq 1.11

$P = \begin{pmatrix} P_0 \\ P_1 \end{pmatrix}$ where P_0 is risk free bond account
P_1 is risky asset.

portfolio to replicate payoffs at nodes B and C

$$1.8211\,\Delta + Be^{0.05} = 0.2159 \quad \text{eq (1)}$$

value of replicating portfolio = value of put option

$$0.5491\,\Delta + Be^{0.05} = 0.6582$$

$$1.272\,\Delta = -0.4423$$

$$\boxed{\Delta = -0.3477} \rightarrow \text{sub (1)}$$

$$1.8211(-0.3477) + Be^{0.05} = 0.2159$$

$$\boxed{B = 0.8077}$$

$$P_A = \begin{pmatrix} 0.8077 \\ -0.3477 \end{pmatrix}$$

At node B

$$3.3164\Delta + Be^{0.05} = 0$$
$$-0.9999\Delta + Be^{0.05} = -0.3749$$

$$2.3165\Delta = -0.3749$$

$$\boxed{\Delta = -0.1618} \rightarrow \text{sub back}$$

$$3.3164(-0.1618) + Be^{0.05} = 0$$

$$\boxed{B = 0.5104}$$

$$\begin{pmatrix} 0.5104 \\ -0.1618 \end{pmatrix}$$

At node C

$$0.9999\Delta + Be^{0.05} = 0.3749$$
$$-0.3015\Delta + Be^{0.05} = 0.8985$$

$$\boxed{\Delta = -0.7497} \rightarrow \text{sub back}$$

$$0.9999(-0.7497) + Be^{0.05} = 0.3749$$

$$\boxed{B = 0.4757}$$

$$\begin{pmatrix} 0.4757 \\ -0.7497 \end{pmatrix}$$

At node D

$$6.0395A + Be^{0.05} = 0$$
$$-1.8210A + Be^{0.05} = 0$$

$$\boxed{A = 0}$$

$$\boxed{B = 0} \qquad \begin{pmatrix} 0 \\ 0 \end{pmatrix}$$

At node E

$$1.8210A + Be^{0.05} = 0$$
$$-0.5490A + Be^{0.05} = 0.651$$

$$\boxed{A = -0.5118}$$

$$\boxed{B = 0.8866}$$

$$1.8210(-0.5118) + Be^{0.05} = 0$$

$$\begin{pmatrix} 0.8866 \\ -0.5118 \end{pmatrix}$$

At node F

$$0.5490A + Be^{0.05} = 0.651$$
$$-0.1656A + Be^{0.05} = 1.0344$$

$$\boxed{A = -0.9922} \quad -1$$

$$0.5490(-0.9922) + Be^{0.05} = 0.651$$

$$\boxed{B = 1.1415} \quad 1.1415$$

$$\begin{pmatrix} 1.1415 \\ -1 \\ -0.9922 \end{pmatrix}$$