'Battle of Sexes'

Between Boy, Girl

→ Cricket (C)

→ Movie H (Harry Potter (H))

Boy \ Girl	C	H
C	10, 5	0, 0
H	0, 0	5, 10

(C, C) (H, H) are NE

		q	1-q
	B \ G	C	H
p	C	10, 5	0, 0
1-p	H	0, 0	5, 10

Boy is employing mixed strategy $p, 1-p$.

i.e. choosing C with prob p
choosing H with prob $1-p$

$$U_G(C) = 5p + 0(1-p)$$
$$= 5p.$$

$$U_G(H) = 0 \times p + 10(1-p)$$
$$= 10(1-p)$$

$U_G(C) = 5p$

$U_G(H) = 10(1-p)$

Therefore girl will randomly choose between C, H only when payoff is equal.

$5p = 10(1-p)$

$$5p = 10(1-p)$$

$$\Rightarrow 15p = 10$$

$$\Rightarrow p = 2/3 \Rightarrow 1-p = 1/3$$

Therefore, probability mixture of boy is $p = \frac{2}{3}$, $1-p = \frac{1}{3}$

i.e. Boy is watching C with prob $\frac{2}{3}$, and H with prob $\frac{1}{3}$.

Let the mixed strategy of girl be $q, 1-q$.

i.e. Girl is randomly choosing to watch C fraction q of time and watch H fraction $1-q$ of time.

$$U_B(C) = 10q + 0(1-q)$$
$$= 10q$$

$$U_B(H) = 0q + 5(1-q)$$
$$= 5(1-q)$$

Boy will randomly choose between C & H only when

$$U_B(C) = U_B(H)$$

$$10q = 5(1-q)$$

$$10q = 5(1-q)$$

$$\Rightarrow 15q = 5$$

$$\Rightarrow \boxed{q = 1/3 \quad 1-q = 2/3}$$

Mixture of Girl is
$q = 1/3$; $1-q = 2/3$
ie randomly choosing C
prob $1/3$ of time and choosing
H randomly fraction $2/3$ of
time.

Therefore, the mixed strategy
Nash Equilibrium of BoS