APPENDIX A: PARAMETERS AND INITIAL CONDITIONS OF THE CARDIO-PULMONARY SYSTEM CIRCUIT MODEL

The values of parameters in the cardiopulmonary system circuit model are shown in **Table A1-A3**,

and the initial conditions include the blood volume at the four chambers and each vessel and the blood flow at the inductor are shown in T**able A4**.

**Table A1**. Resistors and diodes of the blood circulation model

|  |  |  |
| --- | --- | --- |
| Parameter | Description | Value |
| ***Flow Resistances*** | | |
|  | Mitral valve | 0.015 mmHg·s·ml-1 |
|  | Aortic valve | 0.02 mmHg·s·ml-1 |
|  | Head and arm artery | 13 mmHg·s·ml-1 |
|  | Left neck artery | 16 mmHg·s·ml-1 |
|  | Left clavicular artery | 16 mmHg·s·ml-1 |
|  | Proximal aorta | 1.2 mmHg·s·ml-1 |
| and | Right (Left) upper limb artery | 0.4 mmHg·s·ml-1 |
| and | Right (Left) internal carotid artery | 0.4 mmHg·s·ml-1 |
|  | Proximal arteries | See **Eq.11** |
|  | Right subclavian vein | 0.17 mmHg·s·ml-1 |
| and | Right (Left) internal jugular vein | 0.2 mmHg·s·ml-1 |
|  | Left subclavian vein | 0.2 mmHg·s·ml-1 |
|  | Systemic capillaries | 0.2 mmHg·s·ml-1 |
|  | Vena cava | See **Eq.8** |
|  | Tricuspid valve | 0.02 mmHg·s·ml-1 |
|  | Pulmonary valve | 0.02 mmHg·s·ml-1 |
| and | Right (Left) proximal pulmonary artery | 0.02 mmHg·s·ml-1 |
| and | Right (Left) distal pulmonary artery | 0.03 mmHg·s·ml-1 |
| and | Right (Left) pulmonary veins | 0.045 mmHg·s·ml-1 |
| ***Viscoelastic Resistances*** | | |
|  | Head and arm artery | 0.01 mmHg·s·ml-1 |
|  | Left neck artery | 0.01 mmHg·s·ml-1 |
|  | Left clavicular artery | 0.01 mmHg·s·ml-1 |
|  | Proximal aorta | 0.01 mmHg·s·ml-1 |
| and | Right (Left) proximal pulmonary artery | 0.005 mmHg·s·ml-1 |
| and | Right (Left) distal pulmonary artery | 0.005 mmHg·s·ml-1 |
| and | Right (Left) pulmonary veins | 0.005 mmHg·s·ml-1 |

**Table A2**. Inductors of the blood circulation model

|  |  |  |
| --- | --- | --- |
| Parameter | Description | Value |
|  | Proximal aorta | 0.001 mmHg·s2·ml-1 |
| and | Right (Left) proximal pulmonary artery | 0.001 mmHg·s2·ml-1 |

**Table A3**. Capacitors of the blood circulation model

|  |  |  |
| --- | --- | --- |
| Parameter | Description | Value |
|  | Head and arm artery | 1 ml·mmHg-1 |
|  | Left neck artery | 1 ml·mmHg-1 |
|  | Left clavicular artery | 1 ml·mmHg-1 |
|  | Proximal aorta | 0.8 ml·mmHg-1 |
|  | Right upper limb artery | 3 ml·mmHg-1 |
|  | Left upper limb artery | 2 ml·mmHg-1 |
|  | Right internal carotid artery | 2 ml·mmHg-1 |
|  | Left internal carotid artery | 4 ml·mmHg-1 |
|  | Proximal arteries | See **Eq.17** |
|  | Right subclavian vein | 10 ml·mmHg-1 |
| and | Right (Left) internal jugular vein | 10 ml·mmHg-1 |
|  | Left subclavian vein | 10 ml·mmHg-1 |
|  | Systemic capillaries | See **Eq.6** |
|  | Vena cava | See **Eq.7** |
| and | Right (Left) proximal pulmonary artery | 10 ml·mmHg-1 |
| and | Right (Left) distal pulmonary artery | 20 ml·mmHg-1 |
| and | Right (Left) pulmonary veins | 25 ml·mmHg-1 |

**Table A4**. Initial conditions of the blood circulation model

|  |  |  |  |
| --- | --- | --- | --- |
| Compartment | Value | Compartment | Value |
| Total blood volume | 4711 ml |  |  |
| ***Volume*** | | | |
| Left ventricle | 123 ml | Right ventricle | 110 ml |
| Left atrium | 63 ml | Right atrium | 53 ml |
| Head and arm artery | 111 ml | Left neck artery | 117 ml |
| Left clavicular artery | 117 ml | Proximal aorta | 64 ml |
| Right upper limb artery | 29 ml | Left upper limb artery | 19 ml |
| Right internal carotid artery | 20 ml | Left internal carotid artery | 37 ml |
| Proximal arteries | 217 ml | Systemic capillaries | 2526 ml |
| Right subclavian vein | 66 ml | Left subclavian vein | 66 ml |
| Right internal jugular vein | 69 ml | Left internal jugular vein | 66 ml |
| Vena cava | 170 ml | Right proximal pulmonary artery | 64 ml |
| Left proximal pulmonary artery | 64 ml | Right distal pulmonary artery | 140 ml |
| Left distal pulmonary artery | 140 ml | Right pulmonary veins | 130 ml |
| Left pulmonary veins | 130 ml |  |  |
| ***Flow*** | | | |
| Proximal aorta | 40 ml·s-1 | Right proximal pulmonary artery | 16 ml·s-1 |
| Left proximal pulmonary artery | 16 ml·s-1 |  |  |