

## DAFTAR ISI

HALAMAN JUDUL

HALAMAN PENGESAHAN

HALAMAN PERSEMBAHAN

HALAMAN MOTTO

KATA PENGANTAR

HALAMAN SOAL

ABSTRAKSI

DAFTAR ISI

DAFTAR GAMBAR

DAFTAR NOTASI

### BAB I. PENDAHULUAN

|  |    |
|--|----|
| I.1. Latar Belakang Masalah  | 1  |
| I.1.1. <i>Open Center System</i>   | 1  |
| I.1.1.1. <i>Open Center Terhubung Seri</i>   | 3  |
| I.1.1.2. <i>Open Center Terhubung Seri-Paralel</i>                                   | 4  |
| I.1.1.3. <i>Open Center Terhubung dengan Pembagi Aliran<br/>(Flow Divider)</i>       | 5  |
| I.1.2. <i>Close Center System</i>  | 5  |
| I.1.2.1. <i>Close Center System with Fixed Displacement<br/>Pump and Accumulator</i> | 6  |
| I.1.2.2. <i>Close Center System with Variable Displacement<br/>Pump</i>              | 7  |
| I.2. Perumusan Masalah   | 8  |
| I.3. Pembatasan Masalah  | 9  |
| I.4. Tujuan Penulisan  | 9  |
| I.5. Metode Perancangan  | 10 |
| I.5.1. <i>Penjabaran Tugas (Clarification of The Task)</i>                           | 10 |
| I.5.2. <i>Perancangan secara Konsep (Conceptual Design)</i>                          | 10 |
| I.5.3. <i>Perancangan Bentuk (Embodiment Design)</i>                                 | 11 |

|           |  |    |
|-----------|--|----|
| I.5.4.    | Perancangan Rinci ( <i>Detail Design</i> )   | 11 |
| I.6.      | Ruang Lingkup Penulisan  | 11 |
|           |  | 11 |
| BAB II.   | DESKRIPSI TANK PT-76 DAN BTR-50  |    |
| II.1.     | Tank Amfibi Ringan ( <i>Light Amphibious Tank</i> ) PT-76  | 14 |
| II.1.1.   | Deskripsi Umum Kendaraan   | 14 |
| II.1.2.   | Tinjauan Mesin dan Senjata Utama   | 14 |
| II.1.3.   | Data Teknis Kendaraan  | 16 |
| II.1.3.1. | Data Kendaraan   | 16 |
| II.1.3.2. | Data Mesin   | 16 |
| II.1.3.3. | Data Persenjataan Utama  | 17 |
| II.1.3.4. | Data Persenjataan Bantu  | 17 |
| II.2.     | Kendaraan Lapis Baja Pengangkut Personel BTR-50  | 17 |
| II.2.1.   | Deskripsi Umum Kendaraan   | 19 |
| II.2.2.   | Data Teknis Kendaraan  | 19 |
| II.3.     | Pengoperasian Kendaraan  | 20 |
| II.3.1.   | Pengoperasian di Darat   | 23 |
| II.3.2.   | Pengoperasian di Laut  | 24 |
|           |  | 25 |
| BAB III.  | PERHITUNGAN GAYA MEKANIS   |    |
| III.1.    | Perhitungan pada Tuas Pengatur Daun Penutup <i>Water-Jet</i><br>( <i>Water-Jet Propeller Shutter</i> ) | 26 |
| III.1.1.  | <i>Lever 1</i>   | 26 |
| III.1.2.  | <i>Lever 2</i>   | 28 |
| III.1.3.  | <i>Lever 3</i>   | 30 |
| III.1.4.  | <i>Lever 4</i>   | 30 |
| III.1.5.  | <i>Lever 5</i>   | 31 |
| III.1.6.  | <i>Lever 6</i>   | 32 |
| III.2.    | Perhitungan pada Tuas Roda Gigi Reduksi Dalam ( <i>Inner Reduction</i><br><i>Gear Couplings</i> )      | 34 |
| III.2.1.  | <i>Lever 1</i>   | 37 |
| III.2.2.  | <i>Lever 2</i>   | 39 |
| III.2.3.  | <i>Lever 3</i>   | 40 |

|  |    |
|--|----|
| III.2.4. <i>Lever 4</i>  | 41 |
| III.3. Perhitungan pada Tuas Pemindah Persneling ( <i>Gear Box Control</i> ) | 42 |
| III.3.1. <i>Lever 1</i>  | 43 |
| III.3.2. <i>Lever 2</i>  | 46 |
| III.3.3. <i>Lever 3</i>  | 47 |
| III.3.4. <i>Lever 4</i>  | 48 |
|  | 49 |
| <b>BAB IV. AKTUATOR HIDROLIS (<i>HYDRAULIC ACTUATOR</i>)</b>                 |    |
| IV.1. <i>Ram Type Cylinder</i>   | 51 |
| IV.2. <i>Piston Type Cylinder</i>  | 51 |
| IV.2.1. <i>Single Acting Cylinder</i>  | 52 |
| IV.2.2. <i>Double Acting Cylinder</i>  | 52 |
| IV.3. Perancangan Silinder Hidrolis  | 53 |
| IV.3.1. Silinder untuk <i>Water-Jet Propeller Shutter</i>                    | 54 |
| IV.3.2. Silinder pada <i>Inner Reduction Gear Coupling</i>                   | 59 |
| IV.3.3. Silinder untuk Tuas Persneling ( <i>Gear Box Control</i> )           | 63 |
| IV.3.3.1. Batang Persneling Kecepatan 1 dan Mundur                           | 67 |
| IV.3.3.2. Batang Persneling Kecepatan 2 dan 3                                | 67 |
| IV.3.3.3. Batang Persneling Kecepatan 4 dan 5                                | 71 |
|  | 74 |
| <b>BAB V. POMPA HIDROLIS (<i>HYDRAULIC PUMPS</i>)</b>                        |    |
| V.1. <i>Gear Pumps</i>   | 80 |
| V.1.1. Pompa Roda Gigi Luar ( <i>External Gear Pumps</i> )                   | 80 |
| V.1.2. Pompa Roda Gigi Dalam ( <i>Internal Gear Pumps</i> )                  | 80 |
| V.2. <i>Vane Pumps</i>   | 83 |
| V.3. <i>Piston Pumps</i>   | 84 |
| V.4. Pemilihan Pompa   | 85 |
|  | 86 |
| <b>BAB VI. TANGKI HIDROLIS (<i>HYDRAULIC RESERVOIR</i>) DAN FILTER</b>       |    |
| VI.1. Tangki Oli atau <i>Reservoir</i>                                       | 90 |
| VI.2. <i>Filter</i> dan <i>Strainer</i>                                      | 90 |
|  | 94 |
| <b>BAB VII. KATUP PENGATUR (<i>CONTROL VALVE</i>)</b>                        |    |

|   |     |
|---|-----|
| VII.1. Katup Pengatur Tekanan   | 99  |
| VII.1.1. <i>Direct Acting Relief Valve</i>                              | 99  |
| VII.1.2. <i>Pilot Operated Relief Valve</i>                             | 100 |
| VII.2. Katup Pengatur Arah Aliran ( <i>Directional Control Valve</i> )  | 102 |
| VII.2.1. <i>Check Valve</i>   | 104 |
| VII.2.2. <i>Spool Directional Valves</i>                                | 104 |
| VII.3. Katup Pengatur Volume ( <i>Volume Control Valves</i> )           | 105 |
| VII.3.1. <i>Flow Control Valve</i>                                      | 106 |
| VII.3.2. <i>Flow Divider Valve</i>                                      | 106 |
|   | 107 |
| <b>BAB VIII. SALURAN HIDROLIS (<i>HYDRAULIC LINES</i>)</b>              |     |
| VIII.1. Pipa dan <i>Tube</i>  | 109 |
| VIII.1.1. Ukuran  | 109 |
| VIII.1.2. Bahan ( <i>Material</i> ) Pipa dan <i>Tube</i>                | 109 |
| VIII.1.3. Pemasangan  | 110 |
| VIII.1.4. <i>Tube Fitting</i>   | 111 |
| VIII.2. Pipa Karet Fleksibel ( <i>Flexible Hose</i> )                   | 112 |
| VIII.2.1. Ukuran  | 113 |
| VIII.2.2. Penggunaan  | 113 |
| VIII.2.3. Pemasangan  | 116 |
| VIII.2.4. <i>Hose Fitting</i>   | 116 |
| VIII.2.5. Pemilihan <i>Hose</i>   | 117 |
| VIII.3. Rangkaian dan Cara Kerja Sistem Hidrolis                        | 119 |
| VIII.3.1. Rangkaian Hidrolis Silinder                                   | 120 |
| VIII.3.1.1. Gerak Memanjang ( <i>Extend</i> )                           | 121 |
| VIII.3.1.2. Gerak Memendek ( <i>Re-track</i> )                          | 121 |
|   | 122 |
| <b>BAB IX. FLUIDA HIDROLIS (<i>HYDRAULIC FLUIDS</i>)</b>                |     |
| IX.1. Sifat-sifat Fisik Fluida ( <i>Physical Properties of Fluids</i> ) | 123 |
| IX.1.1. Viskositas Fluida ( <i>Fluid Viscosity</i> )                    | 125 |
| IX.1.2. <i>Viscosity Index</i>  | 125 |
| IX.1.3. <i>Specific Gravity</i>   | 127 |
| IX.1.4. <i>Pour Point</i>   | 128 |

|   |     |
|---|-----|
| IX.1.5. <i>Foam Resistance</i>                        | 129 |
| IX.1.6. <i>Film Strength</i> atau <i>Lubricity</i>    | 129 |
| IX.1.7. <i>Demulsibility</i>                          | 129 |
| IX.1.8. <i>Oxidation Resistance</i>                   | 129 |
| IX.2. Pemilihan Minyak Hidrolis                       | 129 |
|   | 130 |
| <b>BAB X. STABILITAS KENDARAAN</b>                    |     |
| X.1. Tekanan Maksimum <i>Tracked Vehicle</i>          | 133 |
| X.2. Tahanan Gulung ( <i>Rolling Resistance</i> )     | 134 |
| X.3. Tahanan Aerodinamis ( <i>Aerodynamic Drag</i> )  | 135 |
| X.4. Tahanan Tanjakan ( <i>Grade Resistance</i> )     | 135 |
| X.5. <i>Track Motion Resistance</i>                   | 136 |
| X.6. Tahanan Dalam ( <i>Internal Resistance</i> )     | 137 |
| X.7. Tahanan Inersia                                  | 138 |
| X.8. Gaya Traksi Kendaraan ( <i>Tractive Effort</i> ) | 139 |
|   | 139 |
| <b>DAFTAR PUSTAKA</b>                                 |     |
| <b>LAMPIRAN</b>                                       |     |