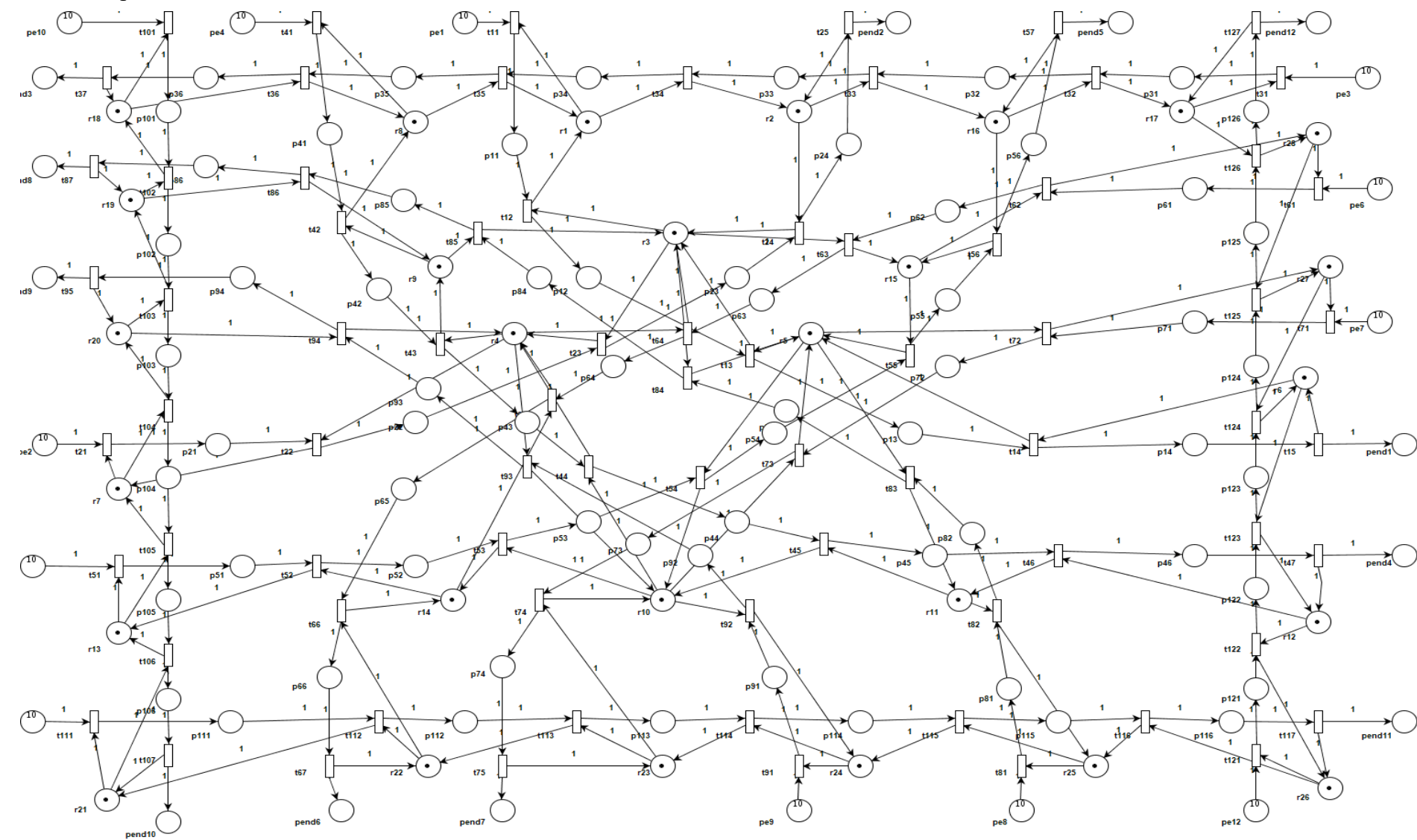
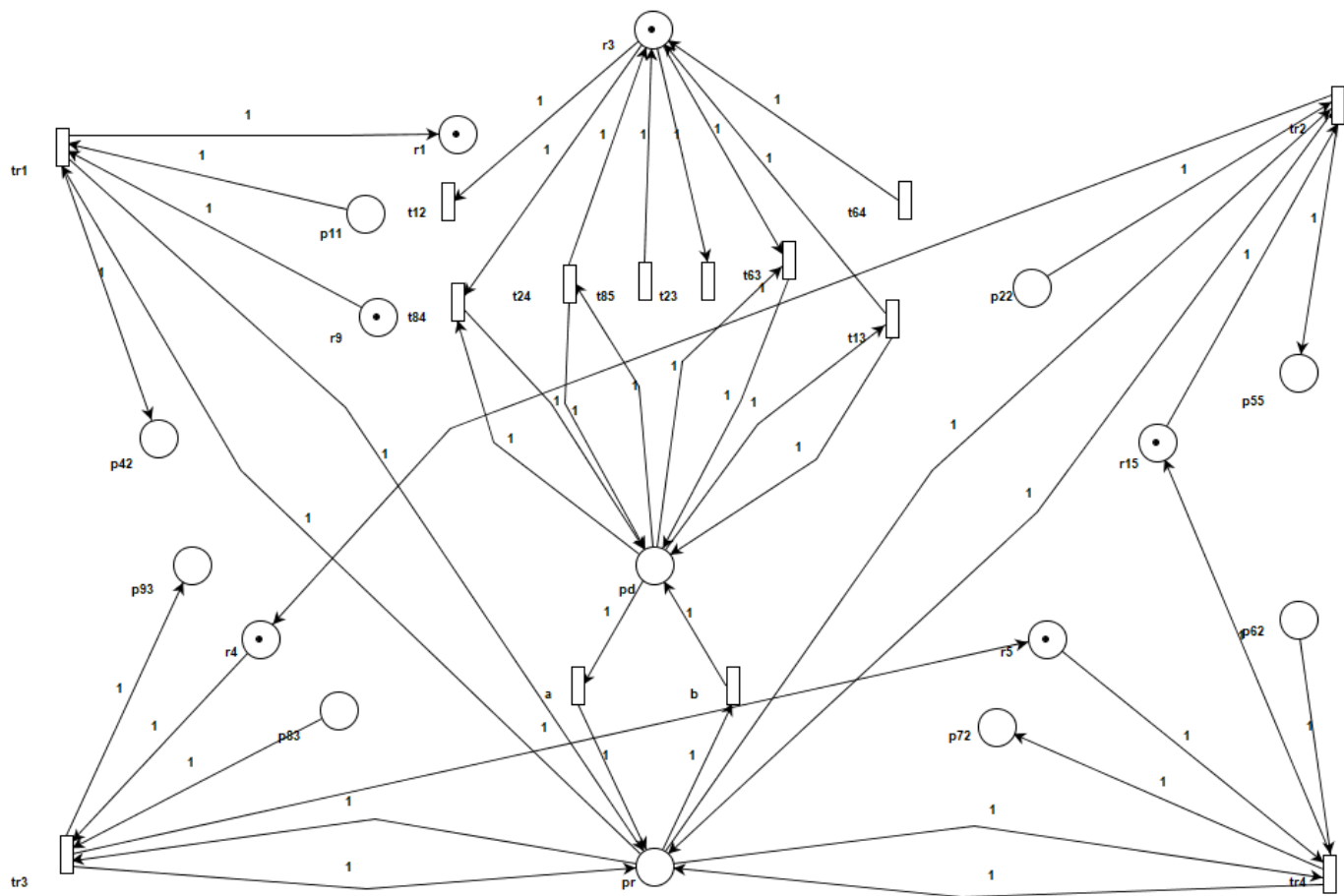


1. The complete RRPN model for a bidirectional four-lane autonomous intersection



2. The failure-recovery structure for resource r_3



3. The complete bidirectional four-lane intersection RRPN-FR model



4. All the controllers added to the complete controlled RRPN-FR

$p_{\theta i}$	$\dot{p}_{\theta i}$	$p_{\theta i} \dot{}$	$M_{\Gamma}(p_{\theta})$
$p_{\theta 1}$	$t_{12}, t_{24}, t_{34}, t_{r1}, t_{r2}, t_{r3}, t_{r4}$	t_{11}, t_{21}, t_{31}	2
$p_{\theta 2}$	$t_{22}, t_{94}, t_{104}, t_{r2}, t_{r4}$	$t_{21}, t_{91}, t_{101}, t_{r1}, t_{r3}$	2
$p_{\theta 3}$	t_{74}, t_{92}, t_{114}	$t_{71}, t_{91}, t_{111}, t_{r1}, t_{r2}, t_{r3}, t_{r4}$	2
$p_{\theta 4}$	$t_{14}, t_{72}, t_{124}, t_{r1}, t_{r3}$	$t_{11}, t_{71}, t_{121}, t_{r2}, t_{r4}$	2
$p_{\theta 5}$	$t_{13}, t_{55}, t_{63}, t_{r1}, t_{r3}$	t_{11}, t_{51}, t_{61}	2
$p_{\theta 6}$	t_{45}, t_{73}, t_{83}	$t_{41}, t_{71}, t_{81}, t_{r2}, t_{r4}$	2
$p_{\theta 7}$	t_{53}, t_{65}, t_{93}	$t_{51}, t_{61}, t_{91}, t_{r1}, t_{r3}$	2
$p_{\theta 8}$	$t_{23}, t_{43}, t_{85}, t_{r2}, t_{r4}$	t_{21}, t_{41}, t_{81}	2
$p_{\theta 9}$	$t_{13}, t_{84}, t_{r1}, t_{r3}$	t_{11}, t_{81}	1
$p_{\theta 10}$	t_{54}, t_{73}	$t_{51}, t_{71}, t_{r2}, t_{r4}$	1
$p_{\theta 11}$	t_{44}, t_{93}	$t_{41}, t_{91}, t_{r1}, t_{r3}$	1
$p_{\theta 12}$	$t_{23}, t_{64}, t_{r2}, t_{r4}$	t_{21}, t_{61}	1
$p_{\theta 13}$	$t_{14}, t_{63}, t_{125}, t_{r1}, t_{r3}$	t_{11}, t_{61}, t_{121}	5
$p_{\theta 14}$	$t_{13}, t_{34}, t_{56}, t_{r1}, t_{r3}$	t_{11}, t_{31}, t_{51}	5
$p_{\theta 15}$	$t_{24}, t_{35}, t_{43}, t_{r2}, t_{r4}$	t_{21}, t_{31}, t_{41}	5
$p_{\theta 16}$	$t_{23}, t_{86}, t_{104}, t_{r2}, t_{r4}$	t_{21}, t_{81}, t_{101}	5
$p_{\theta 17}$	t_{66}, t_{93}, t_{114}	$t_{61}, t_{91}, t_{111}, t_{r1}, t_{r3}$	5
$p_{\theta 18}$	t_{74}, t_{83}, t_{115}	$t_{71}, t_{81}, t_{111}, t_{r2}, t_{r4}$	5
$p_{\theta 19}$	t_{46}, t_{73}, t_{124}	$t_{41}, t_{71}, t_{121}, t_{r2}, t_{r4}$	5
$p_{\theta 20}$	t_{53}, t_{94}, t_{105}	$t_{51}, t_{91}, t_{101}, t_{r1}, t_{r3}$	5
$p_{\theta 21}$	$t_{36}, t_{106}, t_{116}, t_{126}$	$t_{31}, t_{101}, t_{111}, t_{121}$	19