Single machine problems

- **maximal polynomially solvable:**

$1\|prec; r_i\|C_{max}$	Lawler (1973)
$1\|prec; p_i = p; r_i\|L_{max}$	Simons (1978)
$1\|prec; r_i; pmtn\|L_{max}$	Blazewicz (1976), Baker et al. (1983)
$1\|prec; p_i = p; r_i\|\sum C_i$	Simons (1983)
$1\|prec; pmtn; p_i = p; r_i\|\sum C_i$	Baptiste et al. (2004)
$1\|r_i; pmtn\|\sum C_i$	Baker (1974)
$1\|p_i = p; r_i\|\sum w_iC_i$	Baptiste (2000)
$1\|sp-graph\|\sum w_iC_i$	Lawler (1978)
$1\|r_i; pmtn\|\sum U_i$	Lawler (1990)
$1\|p_i = p; r_i\|\sum w_iU_i$	Baptiste (1999)
$1\|pmtn; p_i = p; r_i\|\sum w_iU_i$	Baptiste (1999)
$1\|p_i = p; r_i\|\sum T_i$	Baptiste (2000)
$1\|pmtn; p_i = p; r_i\|\sum T_i$	Tian et al. (2006)
$1\|p_i = 1; r_i\|\sum w_iT_i$	Assignment-problem

- **maximal pseudopolynomially solvable:**

$1\|r_i; pmtn\|\sum w_iU_i$	Lawler (1990)
$1\|\|\sum T_i$	Lawler (1977), Du & Leung (1990)

- **minimal NP-hard:**

*	$1\|r_i\|L_{max}$	Lenstra et al. (1977)
*	$1\|chains; r_i; pmtn\|\sum C_i$	Lenstra (-)
*	$1\|prec\|\sum C_i$	Lawler (1978), Lenstra & Rinnooy Kan (1978)
*	$1\|r_i\|\sum C_i$	Lenstra et al. (1977)
*	$1\|chains; p_i = 1; r_i\|\sum w_iC_i$	Lenstra & Rinnooy Kan (1980)
*	$1\|prec; p_i = 1\|\sum w_iC_i$	Lawler (1978), Lenstra & Rinnooy Kan (1978)
*	$1\|r_i; pmtn\|\sum w_iC_i$	Labetoulle et al. (1984)
*	$1\|chains; p_i = 1\|\sum U_i$	Lenstra & Rinnooy Kan (1980)
	$1\|\|\sum w_iU_i$	Lawler & Moore (1969), Karp (1972)
	$1\|\|\sum T_i$	Lawler (1977), Du & Leung (1990)
*	$1\|chains; p_i = 1\|\sum T_i$	Leung & Young (1990)
*	$1\|\|\sum w_iT_i$	Lawler (1977), Lenstra et al. (1977)

- **minimal open:**

$1|pmtn; p_i = p; r_i|\sum w_iC_i$
$1|p_i = p; r_i|\sum w_iT_i$

- **maximal open:**

$1|p_i = p; r_i|\sum w_iT_i$
$1|pmtn; p_i = p; r_i|\sum w_iT_i$

Parallel machine problems without preemption

- **maximal polynomially solvable:**

$P \mid p_i = p; outtree; r_i \mid C_{max}$	Brucker et al. (1977)
$P \mid p_i = p; tree \mid C_{max}$	Hu (1961) , Davida & Linton (1976)
$Q \mid p_i = p; r_i \mid C_{max}$	Assignment-problem
$Q2 \mid p_i = p; chains \mid C_{max}$	Brucker et al. (1999)
$P \mid p_i = 1; chains; r_i \mid L_{max}$	Dror et al. (1998) , Baptiste et al. (2004)
$P \mid p_i = p; intree \mid L_{max}$	Brucker et al. (1977) , Monma (1982)
$P2 \mid p_i = p; prec \mid L_{max}$	Garey & Johnson (1976)
$P2 \mid p_i = 1; prec; r_i \mid L_{max}$	Garey & Johnson (1977)
$P \mid p_i = 1; outtree; r_i \mid \sum C_i$	Brucker et al. (2002) , Huo & Leung (2005)
$P \mid p_i = p; outtree \mid \sum C_i$	Hu (1961)
$P2 \mid p_i = 1; prec; r_i \mid \sum C_i$	Baptiste & Timkovsky (2004)
$P2 \mid p_i = p; prec \mid \sum C_i$	Coffman & Graham (1972)
$Pm \mid p_i = p; tree \mid \sum C_i$	Baptiste et al. (2004)
$Qm \mid p_i = p; r_i \mid \sum C_i$	Dessouky et al. (1990)
$R \mid\mid \sum C_i$	Horn (1973) , Bruno et al. (1974)
$P \mid p_i = p; r_i \mid \sum w_i C_i$	Brucker & Kravchenko (2008)
$P \mid p_i = 1; r_i \mid \sum w_i U_i$	Networkflowproblem
$Pm \mid p_i = p; r_i \mid \sum w_i U_i$	Baptiste et al. (2004)
$Q \mid p_i = p \mid \sum w_i U_i$	Assignment-problem
$P \mid p_i = p; r_i \mid \sum T_i$	Brucker & Kravchenko (2005)
$P \mid p_i = 1; r_i \mid \sum w_i T_i$	Networkflowproblem
$Q \mid p_i = p \mid \sum w_i T_i$	Assignment-problem

- **maximal pseudopolynomially solvable:**

$Qm \mid r_i \mid C_{max}$	Lawler et al. (1989)
$Qm \mid\mid \sum w_i C_i$	Lawler et al. (1989)
$Qm \mid\mid \sum w_i U_i$	Lawler et al. (1989)

- **minimal NP-hard:**

	$P2 \mid\mid C_{max}$	Lenstra et al. (1977)
*	$P \mid\mid C_{max}$	Garey & Johnson (1978)
*	$P \mid p_i = 1; intree; r_i \mid C_{max}$	Brucker et al. (1977)
*	$P \mid p_i = 1; prec \mid C_{max}$	Ullman (1975)
*	$P2 \mid chains \mid C_{max}$	Du et al. (1991)
*	$Q \mid p_i = p; chains \mid C_{max}$	Kubiak (1988)
*	$P \mid p_i = 1; outtree \mid L_{max}$	Brucker et al. (1977)
*	$P \mid p_i = 1; intree; r_i \mid \sum C_i$	Lenstra (-)
*	$P \mid p_i = 1; prec \mid \sum C_i$	Lenstra & Rinnooy Kan (1978)
*	$P2 \mid chains \mid \sum C_i$	Du et al. (1991)
*	$P2 \mid r_i \mid \sum C_i$	Single-machine problem
	$P2 \mid\mid \sum w_i C_i$	Bruno et al. (1974)
*	$P \mid\mid \sum w_i C_i$	Lenstra (-)
*	$P2 \mid p_i = 1; chains \mid \sum w_i C_i$	Timkovsky (2003)
*	$P2 \mid p_i = 1; chains \mid \sum U_i$	Single-machine problem
*	$P2 \mid p_i = 1; chains \mid \sum T_i$	Single-machine problem

- **minimal open:**

$P2 \mid p_i = p; intree; r_i \mid C_{max}$	$P2 \mid p_i = p; chains; r_i \mid L_{max}$	$Pm \mid p_i = 1; prec \mid \sum C_i$
$Pm \mid p_i = 1; intree; r_i \mid C_{max}$	$Pm \mid p_i = 1; outtree \mid L_{max}$	$Q \mid p_i = p; r_i \mid \sum C_i$
$Pm \mid p_i = 1; prec \mid C_{max}$	$Q2 \mid p_i = p; chains \mid L_{max}$	$Q2 \mid p_i = p; chains \mid \sum C_i$
$Q2 \mid p_i = p; chains; r_i \mid C_{max}$	$Q2 \mid p_i = p; r_i \mid L_{max}$	$Q2 \mid p_i = p; r_i \mid \sum w_i C_i$
$Q2 \mid p_i = p; intree \mid C_{max}$	$P \mid p_i = 1; intree \mid \sum C_i$	$P \mid p_i = p; r_i \mid \sum U_i$
$Q2 \mid p_i = p; outtree \mid C_{max}$	$P2 \mid p_i = p; chains; r_i \mid \sum C_i$	$P2 \mid p_i = p; r_i \mid \sum w_i T_i$
$Qm \mid p_i = p; chains \mid C_{max}$	$Pm \mid p_i = 1; intree; r_i \mid \sum C_i$	

- **maximal open:**

$P \mid p_i = p; chains; r_i \mid L_{max}$	$Q \mid p_i = p; tree \mid \sum C_i$	$Q \mid p_i = p; r_i \mid \sum w_i U_i$
$Qm \mid p_i = p; prec; r_i \mid L_{max}$	$Qm \mid p_i = p; prec; r_i \mid \sum C_i$	$Q \mid p_i = p; r_i \mid \sum w_i T_i$
$Q \mid p_i = p; outtree; r_i \mid \sum C_i$		

Parallel machine problems with preemption

- **maximal polynomially solvable:**

$P\|outtree; pmtn; r_i\|C_{max}$	Lawler (1982)
$P\|tree; pmtn\|C_{max}$	Muntz & Coffman (1970), Gonzalez & Johnson (1980)
$Q\|chains; pmtn\|C_{max}$	Horvath et al. (1977)
$P\|intree; pmtn\|L_{max}$	Lawler (1982)
$Q2\|prec; pmtn; r_i\|L_{max}$	Lawler (1982)
$R\|pmtn; r_i\|L_{max}$	Lawler & Labetoulle (1978)
$P2\|p_i = p; prec; pmtn\|\sum C_i$	Coffman et al. (2003)
$P2\|p_i = p; outtree; pmtn; r_i\|\sum C_i$	Lushchakova (2006)
$P\|p_i = 1; outtree; pmtn; r_i\|\sum C_i$	Brucker et al. (2002), Huo & Leung (2005)
$P\|p_i = p; outtree; pmtn\|\sum C_i$	Brucker et al. (2002)
$Q\|p_i = p; pmtn; r_i\|\sum C_i$	Kravchenko & Werner (2009)
$Q\|pmtn\|\sum C_i$	Labetoulle et al. (1984)
$P\|p_i = p; pmtn\|\sum w_iC_i$	McNaughton (1959)
$Q\|p_i = p; pmtn\|\sum U_i$	Baptiste et al. (2004)
$Qm\|pmtn\|\sum U_i$	Lawler (1979), Lawler & Martel (1989)
$P\|p_i = 1; pmtn; r_i\|\sum w_iU_i$	Brucker et al. (2003)
$Pm\|p_i = p; pmtn\|\sum w_iU_i$	Baptiste (2000B)
$P\|p_i = p; pmtn\|\sum T_i$	Baptiste et al. (2004)
$P\|p_i = 1; pmtn; r_i\|\sum w_iT_i$	Baptiste (2002)

- **maximal pseudopolynomially solvable:**

$Pm\|pmtn\|\sum w_iC_i$	McNaughton (1959), Lawler et al. (1989)
$Qm\|pmtn\|\sum w_iU_i$	Lawler (1979), Lawler & Martel (1989)

- **minimal NP-hard:**

*	$P\|intree; pmtn; r_i\|C_{max}$	Lenstra (-)
*	$P\|p_i = 1; prec; pmtn\|C_{max}$	Ullman (1976)
*	$R2\|chains; pmtn\|C_{max}$	Lenstra (-)
*	$P\|outtree; pmtn\|L_{max}$	Lenstra (-)
	$P2\|pmtn; r_i\|\sum C_i$	Du et al. (1990)
*	$P\|pmtn; r_i\|\sum C_i$	Brucker & Kravchenko (2004)
*	$P2\|chains; pmtn\|\sum C_i$	Du et al. (1991)
*	$R\|pmtn\|\sum C_i$	Sitters (2001)
	$P2\|pmtn\|\sum w_iC_i$	Bruno et al. (1974)
*	$P\|p_i = p; pmtn; r_i\|\sum w_iC_i$	Leung & Young (1990A)
*	$P\|pmtn\|\sum w_iC_i$	Lenstra (-)
*	$P2\|p_i = 1; chains; pmtn\|\sum w_iC_i$	Timkovsky (2003), Du et al. (1991)
*	$P2\|pmtn; r_i\|\sum w_iC_i$	Labetoulle et al. (1984)
	$P\|pmtn\|\sum U_i$	Lawler (1983)
	$P2\|pmtn; r_i\|\sum U_i$	Du et al. (1992)
*	$P2\|p_i = 1; chains; pmtn\|\sum U_i$	Baptiste et al. (2004)
*	$R\|pmtn\|\sum U_i$	Sitters (2001)
	$P\|p_i = p; pmtn\|\sum w_iU_i$	Brucker & Kravchenko (1999)
	$P2\|pmtn\|\sum w_iU_i$	Single-machine problem

- **minimal open:**

$Pm\|p_i = 1; intree; pmtn; r_i\|C_{max}$	$P2\|p_i = 1; intree; pmtn; r_i\|\sum C_i$	$P2\|p_i = p; pmtn; r_i\|\sum U_i$
$Pm\|p_i = 1; prec; pmtn\|C_{max}$	$Pm\|p_i = p; chains; pmtn; r_i\|\sum C_i$	$R2\|pmtn\|\sum U_i$
$Qm\|p_i = p; chains; pmtn; r_i\|C_{max}$	$Pm\|p_i = 1; intree; pmtn\|\sum C_i$	$Q2\|p_i = p; pmtn\|\sum w_iU_i$
$Qm\|p_i = p; intree; pmtn\|C_{max}$	$Q2\|p_i = p; chains; pmtn\|\sum C_i$	$P2\|p_i = 1; chains; pmtn\|\sum T_i$
$Qm\|p_i = p; outtree; pmtn\|C_{max}$	$R2\|pmtn\|\sum C_i$	$P2\|p_i = p; pmtn; r_i\|\sum T_i$
$Pm\|p_i = 1; chains; pmtn; r_i\|L_{max}$	$P2\|p_i = p; pmtn; r_i\|\sum w_iC_i$	$P2\|pmtn\|\sum T_i$
$Pm\|p_i = 1; outtree; pmtn\|L_{max}$	$Q2\|p_i = p; pmtn\|\sum w_iC_i$	$Q2\|p_i = p; pmtn\|\sum T_i$
$Qm\|p_i = p; chains; pmtn\|L_{max}$		$P2\|p_i = p; pmtn\|\sum w_iT_i$

- **maximal open:**

$Q\|outtree; pmtn; r_i\|C_{max}$	$Q\|p_i = p; prec; pmtn; r_i\|\sum C_i$	$Q\|pmtn\|\sum T_i$
$Q\|tree; pmtn\|C_{max}$	$Q\|p_i = p; pmtn; r_i\|\sum U_i$	$Qm\|p_i = p; prec; pmtn; r_i\|\sum T_i$
$Q\|chains; pmtn; r_i\|L_{max}$	$Rm\|pmtn\|\sum U_i$	$Rm\|pmtn\|\sum T_i$
$Q\|intree; pmtn\|L_{max}$	$Qm\|p_i = p; pmtn; r_i\|\sum w_iU_i$	$Q\|p_i = p; pmtn\|\sum w_iT_i$
$Qm\|prec; pmtn; r_i\|L_{max}$	$Q\|p_i = p; tree; pmtn; r_i\|\sum T_i$	$Qm\|p_i = p; pmtn; r_i\|\sum w_iT_i$

Open-shop problems without preemption

- **maximal polynomially solvable:**

$O\|p_{ij}=1;tree\|C_{max}$	Braesel et al. (1994)
$O2\|\|C_{max}$	Gonzalez & Sahni (1976)
$O\|p_{ij}=1;intree\|L_{max}$	Brucker et al. (1993), Brucker (1998)
$O\|p_{ij}=1;chains;r_i\|L_{max}$	Baptiste et al. (2004)
$O2\|p_{ij}=1;prec;r_i\|L_{max}$	Brucker et al. (1993), Brucker (1998)
$O\|p_{ij}=1;outtree\|\sum C_i$	Braesel et al. (1995)
$O2\|p_{ij}=1;outtree;r_i\|\sum C_i$	Lushchakova (2006)
$O2\|p_{ij}=1;prec\|\sum C_i$	Coffman et al. (2003)
$O\|p_{ij}=1;r_i\|\sum C_i$	Brucker & Kravchenko (2004)
$O\|p_{ij}=1\|\sum w_iC_i$	Brucker et al. (1993)
$O\|p_{ij}=1\|\sum U_i$	Liu & Bulfin (1988)
$Om\|p_{ij}=1;r_i\|\sum w_iU_i$	Baptiste (2003)
$O\|p_{ij}=1\|\sum T_i$	Liu & Bulfin (1988)

- **minimal NP-hard:**

	$O3\|\|C_{max}$	Gonzalez & Sahni (1976)
*	$O\|\|C_{max}$	Lenstra (-)
*	$O\|p_{ij}=1;outtree;r_i\|C_{max}$	Timkovsky (2003)
*	$O\|p_{ij}=1;prec\|C_{max}$	Timkovsky (2003)
*	$O2\|chains\|C_{max}$	Tanaev et al. (1994)
*	$O2\|r_i\|C_{max}$	Lawler et al. (1981,1982)
*	$O\|p_{ij}=1;outtree\|L_{max}$	Timkovsky (2003)
*	$O2\|\|L_{max}$	Lawler et al. (1981,1982)
*	$O2\|\|\sum C_i$	Achugbue & Chin (1982)
*	$O2\|p_{ij}=1;chains\|\sum w_iC_i$	Timkovsky (2003)
*	$O3\|p_{ij}=1;chains\|\sum w_iC_i$	Timkovsky (2003)
*	$O\|p_{ij}=1;r_i\|\sum U_i$	Kravchenko (1999)
*	$O2\|p_{ij}=1;chains\|\sum U_i$	Timkovsky (2003)
*	$O3\|p_{ij}=1;chains\|\sum U_i$	Timkovsky (2003)
*	$O2\|p_{ij}=1;chains\|\sum T_i$	Timkovsky (2003)
*	$O3\|p_{ij}=1;chains\|\sum T_i$	Timkovsky (2003)

- **minimal open:**

$O3\|p_{ij}=1;intree;r_i\|C_{max}$	$O3\|p_{ij}=1;chains;r_i\|\sum C_i$	$O2\|p_{ij}=1;r_i\|\sum T_i$
$O3\|p_{ij}=1;outtree;r_i\|C_{max}$	$O3\|p_{ij}=1;intree\|\sum C_i$	$O3\|p_{ij}=1;r_i\|\sum T_i$
$O3\|p_{ij}=1;prec\|C_{max}$	$O2\|p_{ij}=1;r_i\|\sum w_iC_i$	$O2\|p_{ij}=1\|\sum w_iT_i$
$O3\|p_{ij}=1;outtree\|L_{max}$	$O3\|p_{ij}=1;r_i\|\sum w_iC_i$	$O3\|p_{ij}=1\|\sum w_iT_i$
$O2\|p_{ij}=1;intree;r_i\|\sum C_i$	$O\|p_{ij}=1\|\sum w_iU_i$	

- **maximal open:**

$O\|p_{ij}=1;intree;r_i\|L_{max}$	$O\|p_{ij}=1;prec;r_i\|\sum C_i$	$O\|p_{ij}=1;r_i\|\sum w_iT_i$
$Om\|p_{ij}=1;prec;r_i\|L_{max}$	$O\|p_{ij}=1\|\sum w_iU_i$	

Open-shop problems with preemption

- **maximal polynomially solvable:**

$O\|pmtn;r_i\|L_{max}$	Cho & Sahni (1981)

- **minimal NP-hard:**

*	$O2\|chains;pmtn\|C_{max}$	Lenstra (-)
	$O2\|pmtn\|\sum C_i$	Du & Leung (1993)
*	$O2\|chains;pmtn\|\sum C_i$	Lenstra (-)
*	$O2\|pmtn;r_i\|\sum C_i$	Sriskandarajah & Wagneur (1994)
*	$O3\|pmtn\|\sum C_i$	Liu & Bulfin (1985)
*	$O2\|pmtn\|\sum w_iC_i$	Lenstra (-)
	$O2\|pmtn\|\sum U_i$	Lawler et al. (1981,1982)

Flow-shop problems without preemption

- **maximal polynomially solvable:**

$F\|p_{ij}=1;outtree;r_i\|C_{max}$	Bruno et al. (1980)
$F\|p_{ij}=1;tree\|C_{max}$	Bruno et al. (1980)
$F2\|\|C_{max}$	Johnson (1954)
$F\|p_{ij}=1;intree\|L_{max}$	Bruno et al. (1980)
$F2\|p_{ij}=1;prec;r_i\|L_{max}$	Bruno et al. (1980)
$F\|p_{ij}=1;outtree;r_i\|\sum C_i$	Brucker & Knust (1999)
$F2\|p_{ij}=1;prec;r_i\|\sum C_i$	Baptiste & Timkovsky (2004)
$Fm\|p_{ij}=1;intree\|\sum C_i$	Averbakh et al. (2005)
$F\|p_{ij}=1;r_i\|\sum w_iU_i$	Single-machine problem
$F\|p_{ij}=1;r_i\|\sum w_iT_i$	Single-machine problem

- **minimal NP-hard:**

*	$F\|p_{ij}=1;intree;r_i\|C_{max}$	Brucker & Knust (1999)
*	$F\|p_{ij}=1;prec\|C_{max}$	Leung et al. (1984) , Timkovsky (2003)
*	$F2\|chains\|C_{max}$	Lenstra et al. (1977)
*	$F2\|r_i\|C_{max}$	Lenstra et al. (1977)
*	$F3\|\|C_{max}$	Garey et al. (1976)
*	$F\|p_{ij}=1;outtree\|L_{max}$	Brucker & Knust (1999)
*	$F2\|\|L_{max}$	Lenstra et al. (1977)
*	$F2\|\|\sum C_i$	Garey et al. (1976)
*	$F2\|p_{ij}=1;chains\|\sum w_iC_i$	Tanaev et al. (1994)
*	$F3\|p_{ij}=1;chains\|\sum w_iC_i$	Tanaev et al. (1994)
*	$F2\|p_{ij}=1;chains\|\sum U_i$	Brucker & Knust (1999)
*	$F3\|p_{ij}=1;chains\|\sum U_i$	Brucker & Knust (1999)
*	$F2\|p_{ij}=1;chains\|\sum T_i$	Brucker & Knust (1999)
*	$F3\|p_{ij}=1;chains\|\sum T_i$	Brucker & Knust (1999)

- **minimal open:**

$F3|p_{ij}=1;intree;r_i|C_{max}$ $F3|p_{ij}=1;prec|C_{max}$

$F3|p_{ij}=1;chains;r_i|L_{max}$ $F3|p_{ij}=1;outtree|L_{max}$

$F|p_{ij}=1;intree|\sum C_i$ $F3|p_{ij}=1;intree;r_i|\sum C_i$ $F3|p_{ij}=1;tree|\sum C_i$

- **maximal open:**

$F|p_{ij}=1;chains;r_i|L_{max}$ $Fm|p_{ij}=1;prec;r_i|L_{max}$ $F|p_{ij}=1;prec;r_i|\sum C_i$

Flow-shop problems with preemption

- **maximal polynomially solvable:**

$F2\|pmtn\|C_{max}$	Gonzalez & Sahni (1978), Cho & Sahni (1981)

- **minimal NP-hard:**

*	$F2\|chains; pmtn\|C_{max}$	Lenstra (-)
*	$F2\|r_i; pmtn\|C_{max}$	Gonzalez & Sahni (1978), Cho & Sahni (1981)
*	$F3\|pmtn\|C_{max}$	Gonzalez & Sahni (1978), Cho & Sahni (1981)
*	$F2\|pmtn\|L_{max}$	Gonzalez & Sahni (1978), Cho & Sahni (1981)
*	$F2\|pmtn\|\sum C_i$	Du & Leung (1993)

Job-shop problems without preemption

- **maximal polynomially solvable:**

$J2\|p_{ij}=1;r_i\|C_{max}$	Timkovsky (1997)
$J2\|p_{ij}=1\|\sum C_i$	Kubiak & Timkovsky (1996)
$J2\|p_{ij}=1\|\sum U_i$	Kravchenko (1999A)
$J\|prec;p_{ij}=1;r_i;n=k\|\sum w_iU_i$	Brucker & Kraemer (1996)
$J\|prec;r_i;n=2\|\sum w_iU_i$	Sotskov (1991)
$J2\|n=k\|\sum w_iU_i$	Brucker et al. (1997A)
$J\|prec;p_{ij}=1;r_i;n=k\|\sum w_iT_i$	Brucker & Kraemer (1996)
$J\|prec;r_i;n=2\|\sum w_iT_i$	Sotskov (1991)
$J2\|n=k\|\sum w_iT_i$	Brucker et al. (1997A)

- **maximal pseudopolynomially solvable:**

$J\|prec;r_i;n=k\|\sum w_iU_i$	Middendorf & Timkovsky (1999)
$J2\|p_{ij}=1\|\sum w_iU_i$	Kravchenko (1999A)
$J\|prec;r_i;n=k\|\sum w_iT_i$	Middendorf & Timkovsky (1999)

- **minimal NP-hard:**

	$J3\|n=3\|C_{max}$	Sotskov & Shakhlevich (1995)
*	$J2\|\|C_{max}$	Lenstra & Rinnooy Kan (1979)
*	$J2\|chains;p_{ij}=1\|C_{max}$	Timkovsky (1985)
*	$J3\|p_{ij}=1\|C_{max}$	Lenstra & Rinnooy Kan (1979)
	$J2\|p_{ij}=1;r_i\|\sum C_i$	Timkovsky (1998)
	$J3\|n=3\|\sum C_i$	Sotskov & Shakhlevich (1995)
*	$J2\|\|\sum C_i$	Garey et al. (1976)
*	$J2\|chains;p_{ij}=1\|\sum C_i$	Timkovsky (1998)
*	$J3\|p_{ij}=1\|\sum C_i$	Lenstra (-)
	$J2\|p_{ij}=1\|\sum w_iC_i$	Timkovsky (1998)
*	$J2\|p_{ij}=1;r_i\|\sum w_iC_i$	Timkovsky (1998)
	$J2\|p_{ij}=1;r_i\|\sum U_i$	Timkovsky (1998)
	$J2\|p_{ij}=1\|\sum w_iU_i$	Kravchenko (1999A)
*	$J2\|p_{ij}=1\|\sum w_iT_i$	Timkovsky (1998)

- **minimal open:**

$J2\|chains;n=3\|C_{max}$	$J2\|chains;n=3\|\sum C_i$	$J2\|p_{ij}=1;r_i\|L_{max}$
$J2\|r_i;n=3\|C_{max}$	$J2\|r_i;n=3\|\sum C_i$	$J2\|p_{ij}=1\|\sum T_i$

- **maximal open:**

$J2\|p_{ij}=1;r_i\|L_{max}$ $J2\|prec;r_i;n=k\|\sum w_iU_i$	$J2\|p_{ij}=1\|\sum T_i$	$J2\|prec;r_i;n=k\|\sum w_iT_i$

Job-shop problems with preemption

- **maximal polynomially solvable:**

$J\|prec; r_i; n = 2; pmtn\|\sum w_iU_i$	Sotskov (1991)
$J\|prec; r_i; n = 2; pmtn\|\sum w_iT_i$	Sotskov (1991)

- **maximal pseudopolynomially solvable:**

$J\|prec; r_i; n = k; pmtn\|\sum w_iU_i$	Middendorf & Timkovsky (1999)
$J\|prec; r_i; n = k; pmtn\|\sum w_iT_i$	Middendorf & Timkovsky (1999)

- **minimal NP-hard:**

	$J2\|n = 3; pmtn\|C_{max}$	Brucker et al. (1999B)
$*$	$J2\|pmtn\|C_{max}$	Lenstra & Rinnooy Kan (1979)
	$J2\|n = 3; pmtn\|\sum C_i$	Brucker et al. (1999B)
$*$	$J2\|pmtn\|\sum C_i$	Lenstra (-)

Open-shop problems with nowait

- **maximal polynomially solvable:**

$O\|p_{ij}=1;tree;no-wait\|C_{max}$	Brucker et al. (1993) , Hu (1961)
$O2\|p_{ij}=1;chains;r_i;no-wait\|C_{max}$	Timkovsky (2003)
$O2\|p_{ij}=1;prec;no-wait\|C_{max}$	Brucker et al. (1993) , Coffman & Graham (1972)
$O\|p_{ij}=1;intree;no-wait\|L_{max}$	Brucker et al. (1993) , Brucker et al. (1977)
$O\|p_{ij}=1;r_i;no-wait\|L_{max}$	Brucker et al. (1993) , Simons (1983)
$O\|p_{ij}=1;outtree;no-wait\|\sum C_i$	Brucker et al. (1993) , Hu (1961)
$O\|p_{ij}=1;r_i;no-wait\|\sum C_i$	Timkovsky (2003)
$O2\|p_{ij}=1;chains;r_i;no-wait\|\sum C_i$	Timkovsky (2003)
$O2\|p_{ij}=1;prec;no-wait\|\sum C_i$	Timkovsky (2003)
$Om\|p_{ij}=1;intree;no-wait\|\sum C_i$	Baptiste et al. (2004)
$Om\|p_{ij}=1;r_i;no-wait\|\sum w_iC_i$	Timkovsky (2003)
$O\|p_{ij}=1;no-wait\|\sum w_iU_i$	Kubiak et al. (1991)
$Om\|p_{ij}=1;r_i;no-wait\|\sum w_iU_i$	Baptiste et al. (2004)
$Om\|p_{ij}=1;r_i;no-wait\|\sum T_i$	Timkovsky (2003)
$O\|p_{ij}=1;no-wait\|\sum w_iT_i$	Brucker et al. (1993)

- **minimal NP-hard:**

* $O\|p_{ij}=1;prec;no-wait\|C_{max}$	Ullman (1975)
* $O2\|no-wait\|C_{max}$	Sahni & Cho (1979)
* $O\|p_{ij}=1;outtree;no-wait\|L_{max}$	Brucker et al. (1977)
* $O\|p_{ij}=1;prec;no-wait\|\sum C_i$	Lenstra & Rinnooy Kan (1978)
* $O2\|no-wait\|\sum C_i$	Kubiak et al. (1991)
* $O2\|p_{ij}=1;chains;no-wait\|\sum w_iC_i$	Timkovsky (2003)
* $O3\|p_{ij}=1;chains;no-wait\|\sum w_iC_i$	Timkovsky (2003)
* $O2\|p_{ij}=1;chains;no-wait\|\sum U_i$	Timkovsky (2003)
* $O3\|p_{ij}=1;chains;no-wait\|\sum U_i$	Timkovsky (2003)
* $O2\|p_{ij}=1;chains;no-wait\|\sum T_i$	Timkovsky (2003)
* $O3\|p_{ij}=1;chains;no-wait\|\sum T_i$	Timkovsky (2003)

- **minimal open:**

$O2|p_{ij}=1;intree;r_i;no-wait|C_{max}$
$O2|p_{ij}=1;outtree;r_i;no-wait|C_{max}$
$O3|p_{ij}=1;chains;r_i;no-wait|C_{max}$
$O3|p_{ij}=1;prec;no-wait|C_{max}$
$O2|p_{ij}=1;chains;r_i;no-wait|L_{max}$
$O2|p_{ij}=1;outtree;no-wait|L_{max}$
$O3|p_{ij}=1;outtree;no-wait|L_{max}$
$O2|p_{ij}=1;intree;r_i;no-wait|\sum C_i$
$O2|p_{ij}=1;outtree;r_i;no-wait|\sum C_i$
$O3|p_{ij}=1;chains;r_i;no-wait|\sum C_i$
$O3|p_{ij}=1;tree;no-wait|\sum C_i$
$O|p_{ij}=1;intree;no-wait|\sum C_i$
$O|p_{ij}=1;r_i;no-wait|\sum w_iC_i$
$O|p_{ij}=1;r_i;no-wait|\sum U_i$
$O|p_{ij}=1;r_i;no-wait|\sum T_i$
$O2|p_{ij}=1;r_i;no-wait|\sum w_iT_i$
$O3|p_{ij}=1;r_i;no-wait|\sum w_iT_i$

- **maximal open:**

$O|p_{ij}=1;tree;r_i;no-wait|C_{max}$
$O|p_{ij}=1;intree;r_i;no-wait|L_{max}$
$Om|p_{ij}=1;prec;r_i;no-wait|L_{max}$
$O|p_{ij}=1;tree;r_i;no-wait|\sum C_i$
$Om|p_{ij}=1;prec;r_i;no-wait|\sum C_i$
$O|p_{ij}=1;r_i;no-wait|\sum w_iU_i$
$O|p_{ij}=1;r_i;no-wait|\sum w_iT_i$

Flow-shop problems with nowait

- **maximal polynomially solvable:**

  $F2|no-wait|C_{max}$ Gilmore & Gomory (1964), Reddi & Ramamoorthy (1972)

- **minimal NP-hard:**
  - $F2|r_i; no-wait|C_{max}$ Roeck (1984)
  - $F3|no-wait|C_{max}$ Roeck (1984A)
  - $F2|no-wait|L_{max}$ Roeck (1984)
  - $F2|no-wait|\sum C_i$ Roeck (1984)

- **minimal open:**

  $F2|chains; no-wait|C_{max}$

- **maximal open:**

  $F2|prec; no-wait|C_{max}$

Job-shop problems with nowait

- **maximal polynomially solvable:**

$J2\|p_{ij}=1;no-wait\|\sum C_i$	Kravchenko (1998)
$J\|prec;r_i;n=k;no-wait\|\sum w_iU_i$	Baptiste et al. (2004)
$J\|prec;r_i;n=k;no-wait\|\sum w_iT_i$	Baptiste et al. (2004)

- **maximal pseudopolynomially solvable:**

$J2\|p_{ij}=1;no-wait\|C_{max}$	Timkovsky (1985) , Kubiak (1989)

- **minimal NP-hard:**

	$J2\|p_{ij}=1;no-wait\|C_{max}$	Timkovsky (1985) , Kubiak (1989)
*	$J2\|chains;p_{ij}=1;no-wait\|C_{max}$	Timkovsky (1998)
*	$J2\|no-wait\|C_{max}$	Sahni & Cho (1979)
*	$J3\|p_{ij}=1;no-wait\|C_{max}$	Sriskandarajah & Ladet (1986)
*	$J2\|p_{ij}=1;r_i;no-wait\|L_{max}$	Timkovsky (1998)
*	$J2\|chains;p_{ij}=1;no-wait\|\sum C_i$	Timkovsky (1998)
*	$J2\|no-wait\|\sum C_i$	Roeck (1984)
*	$J2\|p_{ij}=1;r_i;no-wait\|\sum C_i$	Timkovsky (1998)
*	$J3\|p_{ij}=1;no-wait\|\sum C_i$	Sriskandarajah & Ladet (1986)
	$J2\|p_{ij}=1;no-wait\|\sum w_iC_i$	Timkovsky (1998)
*	$J2\|p_{ij}=1;no-wait\|\sum w_iT_i$	Timkovsky (1998)

Multiprocessor task problems with dedicated processors

- **maximal polynomially solvable:**

$P2\|fix_i\|C_{max}$	Hoogeveen et al. (1994)
$Pm\|r_i; p_i = 1; fix_i\|C_{max}$	Brucker & Kraemer (1996)
$Pm\|r_i; p_i = 1; fix_i\| \sum C_i$	Brucker & Kraemer (1996)
$Pm\|p_i = 1; fix_i\| \sum w_iC_i$	Brucker & Kraemer (1996)
$Pm\|p_i = 1; fix_i\| \sum w_iU_i$	Brucker & Kraemer (1996)
$Pm\|p_i = 1; fix_i\| \sum T_i$	Brucker & Kraemer (1996)

- **minimal NP-hard:**

*	$P\|p_i = 1; fix_i\|C_{max}$	Hoogeveen et al. (1994)
*	$P2\|chains; p_i = 1; fix_i\|C_{max}$	Hoogeveen et al. (1994), Blazewicz et al. (1983)
*	$P2\|r_i; fix_i\|C_{max}$	Hoogeveen et al. (1994)
*	$P3\|fix_i\|C_{max}$	Blazewicz et al. (1992), , Hoogeveen et al. (1994)
*	$P2\|fix_i\|L_{max}$	Hoogeveen et al. (1994)
*	$P\|p_i = 1; fix_i\| \sum C_i$	Hoogeveen et al. (1994)
*	$P2\|fix_i\| \sum C_i$	Hoogeveen et al. (1994), Cai et al. (1998)
*	$P2\|chains; p_i = 1; fix_i\| \sum C_i$	Hoogeveen et al. (1994), Blazewicz et al. (1983)

- **minimal open:**

$P2|r_i; p_i = 1; fix_i|L_{max}$
$P2|r_i; p_i = 1; fix_i| \sum w_iC_i$
$P2|p_i = 1; fix_i| \sum w_iT_i$

- **maximal open:**

$Pm|r_i; p_i = 1; fix_i| \sum w_iU_i$
$Pm|r_i; p_i = 1; fix_i| \sum w_iT_i$

Multiprocessor task problems with dedicated processors and preemption

- **maximal polynomially solvable:**

$Pm\|r_i; pmtn; fix_i\|L_{max}$	Bianco et al. (1997)
$P2\|pmtn; fix_i\|\sum C_i$	Cai et al. (1998)

- **maximal pseudopolynomially solvable:**

- **minimal NP-hard:**

*	$P\|pmtn; fix_i\|C_{max}$	Hoogeveen et al. (1994) , Kubale (1990)
*	$P2\|chains; pmtn; fix_i\|C_{max}$	Hoogeveen et al. (1994)
*	$P\|pmtn; fix_i\|\sum C_i$	Hoogeveen et al. (1994)
*	$P2\|chains; pmtn; fix_i\|\sum C_i$	Hoogeveen et al. (1994)
*	$P2\|pmtn; fix_i\|\sum w_iC_i$	Oguz & Qi (2006)

- **minimal open:**

$P2|r_i; pmtn; fix_i|\sum C_i$
$P3|pmtn; fix_i|\sum C_i$
$P2|pmtn; fix_i|\sum U_i$
$P2|pmtn; fix_i|\sum T_i$

- **maximal open:**

$Pm|r_i; pmtn; fix_i|\sum w_iU_i$
$Pm|r_i; pmtn; fix_i|\sum T_i$

Multiprocessor task problems with parallel processors

- **maximal polynomially solvable:**

$P\|outtree; r_i; p_i = p\|C_{max}$	Brucker et al. (1977)
$P\|tree; p_i = p\|C_{max}$	Hu (1961) , Davida & Linton (1976)
$P2\|prec; p_i = p; size_i\|C_{max}$	Lloyd (1981)
$Pm\|r_i; p_i = p; size_i\|C_{max}$	Baptiste (2003B)
$P\|chains; r_i; p_i = 1\|L_{max}$	Dror et al. (1998) , Baptiste et al. (2004)
$P\|intree; p_i = p\|L_{max}$	Brucker et al. (1977) , Monma (1982)
$P2\|prec; r_i; p_i = 1\|L_{max}$	Garey & Johnson (1977)
$P\|\|\sum C_i$	Bruno et al. (1974)
$P\|outtree; p_i = p\|\sum C_i$	Hu (1961)
$P\|outtree; r_i; p_i = 1\|\sum C_i$	Brucker et al. (2002)
$P2\|prec; p_i = p\|\sum C_i$	Coffman & Graham (1972)
$Pm\|intree; p_i = p\|\sum C_i$	Baptiste et al. (2004)
$Pm\|r_i; p_i = p; size_i\|\sum C_i$	Baptiste (2003B)
$P\|r_i; p_i = p\|\sum w_iC_i$	Brucker & Kravchenko (2008)
$Pm\|p_i = p; size_i\|\sum w_iC_i$	Drozdowski & Dell' Olmo (2000)
$P2\|r_i; p_i = 1; size_i\|L_{max}$	Baptiste & Schieber (2003)
$Pm\|r_i; p_i = p\|\sum w_iU_i$	Baptiste et al. (2004)
$Pm\|p_i = p; size_i\|\sum w_iU_i$	Brucker et al. (2000)
$P\|r_i; p_i = p\|\sum T_i$	Brucker & Kravchenko (2005)
$Pm\|p_i = p; size_i\|\sum T_i$	Brucker et al. (2000)
$P\|p_i = p\|\sum w_iU_i, \sum w_iT_i$	Assignment-problem
$P\|r_i; p_i = 1\|\sum w_iU_i, \sum w_iT_i$	Networkflowproblem

- **maximal pseudopolynomially solvable:**

$P3\|size_i\|C_{max}$	Du & Leung (1989)
$Pm\|r_i\|C_{max}$, $Pm\|\|\sum w_iC_i$, $Pm\|\|\sum w_iU_i$	Lawler et al. (1989)

- **minimal NP-hard:**

	$P2\|\|C_{max}$	Lenstra et al. (1977)
*	$P\|\|C_{max}$	Garey & Johnson (1978)
*	$P\|intree; r_i; p_i = 1\|C_{max}$	Brucker et al. (1977)
*	$P\|p_i = 1; size_i\|C_{max}$	Lloyd (1981)
*	$P\|prec; p_i = 1\|C_{max}$	Ullman (1975)
*	$P2\|chains\|C_{max}$	Du et al. (1991)
*	$P2\|chains; r_i; p_i = 1; size_i\|C_{max}$	Brucker et al. (2000)
*	$P2\|r_i; size_i\|C_{max}$	Lee & Cai (1999)
*	$P3\|chains; p_i = 1; size_i\|C_{max}$	Blazewicz & Liu (1996)
*	$P5\|size_i\|C_{max}$	Du & Leung (1989)
*	$P\|outtree; p_i = 1\|L_{max}$	Brucker et al. (1977)
*	$P2\|chains; p_i = 1; size_i\|L_{max}$	Brucker et al. (2000)
*	$P2\|size_i\|L_{max}$	Lee & Cai (1999)
	$P2\|size_i\|\sum C_i$	Lee & Cai (1999)
*	$P\|intree; r_i; p_i = 1\|\sum C_i$	Lenstra (-)
*	$P\|p_i = 1; size_i\|\sum C_i$	Drozdowski & Dell' Olmo (2000)
*	$P\|prec; p_i = 1\|\sum C_i$	Lenstra & Rinnooy Kan (1978)
*	$P2\|chains\|\sum C_i$	Du et al. (1991)
*	$P2\|intree; p_i = 1; size_i\|\sum C_i$	Zinder & Do (2005)
*	$P2\|outtree; p_i = 1; size_i\|\sum C_i$	Zinder et al. (2005)
*	$P2\|r_i\|\sum C_i$	Single-machine problem
	$P2\|\|\sum w_iC_i$	Bruno et al. (1974)
*	$P\|\|\sum w_iC_i$	Lenstra (-)
*	$P2\|chains; p_i = 1\|\sum w_iC_i$	Timkovsky (1998)
*	$P2\|size_i\|\sum w_iC_i$	Lee & Cai (1999)
*	$P2\|chains; p_i = 1\|\sum U_i, \sum T_i$	Single-machine problem

- **minimal open:**

$P2|r_i; p_i = p; size_i|L_{max}$
$Pm|r_i; p_i = 1; size_i|L_{max}$
$P2|chains; p_i = 1; size_i|\sum C_i$
$P2|r_i; p_i = 1; size_i|\sum w_iC_i$
$P2|r_i; p_i = 1; size_i|\sum U_i$
$P2|r_i; p_i = 1; size_i|\sum T_i$
$P2|p_i = 1; size_i|\sum w_iT_i$

- **maximal open:**

$Pm|chains; r_i; p_i = p; size_i|\sum C_i$ $Pm|r_i; p_i = p; size_i|\sum w_iU_i$ $Pm|r_i; p_i = p; size_i|\sum w_iT_i$

Multiprocessor task problems with parallel processors and preemption

- **maximal polynomially solvable:**

$P\|outtree; pmtn; r_i\|C_{max}$	Lawler (1982)
$P\|tree; pmtn\|C_{max}$	Muntz & Coffman (1970), Gonzalez & Johnson (1980)
$Q\|chains; pmtn\|C_{max}$	Horvath et al. (1977)
$P\|intree; pmtn\|L_{max}$	Lawler (1982)
$Pm\|pmtn; r_i; size_i\|L_{max}$	Blazewicz et al. (1996)
$Q2\|prec; pmtn; r_i\|L_{max}$	Lawler (1982)
$R\|pmtn; r_i\|L_{max}$	Lawler & Labetoulle (1978)
$P2\|p_i = p; prec; pmtn\|\sum C_i$	Coffman et al. (2003)
$P2\|p_i = p; outtree; pmtn; r_i\|\sum C_i$	Lushchakova (2006)
$P\|p_i = p; pmtn; r_i\|\sum C_i$	Brucker & Kravchenko (2004)
$P\|p_i = 1; outtree; pmtn; r_i\|\sum C_i$	Brucker et al. (2002), Huo & Leung (2005)
$P\|p_i = p; outtree; pmtn\|\sum C_i$	Brucker et al. (2002)
$Q\|pmtn\|\sum C_i$	Labetoulle et al. (1984)
$P\|p_i = p; pmtn\|\sum w_iC_i$	McNaughton (1959)
$Q\|p_i = p; pmtn\|\sum U_i$	Baptiste et al. (2004)
$Qm\|pmtn\|\sum U_i$	Lawler (1979), Lawler & Martel (1989)
$P\|p_i = 1; pmtn; r_i\|\sum w_iU_i$	Brucker et al. (2003)
$Pm\|p_i = p; pmtn\|\sum w_iU_i$	Baptiste (2000B)
$P\|p_i = p; pmtn\|\sum T_i$	Baptiste et al. (2004)
$P\|p_i = 1; pmtn; r_i\|\sum w_iT_i$	Baptiste (2002)

- **maximal pseudopolynomially solvable:**

$Pm\|pmtn\|\sum w_iC_i$	McNaughton (1959), Lawler et al. (1989)
$Qm\|pmtn\|\sum w_iU_i$	Lawler (1979), Lawler & Martel (1989)

- **minimal NP-hard:**

	$P\|p_i = 1; pmtn; size_i\|C_{max}$	Drozdowski (1992)
*	$P\|intree; pmtn; r_i\|C_{max}$	Lenstra (-)
*	$P\|p_i = 1; prec; pmtn\|C_{max}$	Ullman (1976)
*	$R2\|chains; pmtn\|C_{max}$	Lenstra (-)
*	$P\|outtree; pmtn\|L_{max}$	Lenstra (-)
	$P2\|pmtn; r_i\|\sum C_i$	Du et al. (1990)
	$P\|pmtn; size_i\|\sum C_i$	Drozdowski & Dell' Olmo (2000)
*	$P\|pmtn; r_i\|\sum C_i$	Brucker & Kravchenko (2004)
*	$P2\|chains; pmtn\|\sum C_i$	Du et al. (1991)
*	$R\|pmtn\|\sum C_i$	Sitters (2001)
	$P2\|pmtn\|\sum w_iC_i$	Bruno et al. (1974)
*	$P\|p_i = p; pmtn; r_i\|\sum w_iC_i$	Leung & Young (1990A)
*	$P\|pmtn\|\sum w_iC_i$	Lenstra (-)
*	$P2\|p_i = 1; chains; pmtn\|\sum w_iC_i$	Timkovsky (2003), Du et al. (1991)
*	$P2\|pmtn; r_i\|\sum w_iC_i$	Labetoulle et al. (1984)
	$P\|pmtn\|\sum U_i$	Lawler (1983)
	$P2\|pmtn; r_i\|\sum U_i$	Du et al. (1992)
*	$P2\|p_i = 1; chains; pmtn\|\sum U_i$	Baptiste et al. (2004)
*	$R\|pmtn\|\sum U_i$	Sitters (2001)
	$P\|p_i = p; pmtn\|\sum w_iU_i$	Brucker & Kravchenko (1999)
	$P2\|pmtn\|\sum w_iU_i$	Single-machine problem

- **minimal open:**

$P2\|p_i = 1; chains; pmtn; size_i\|C_{max}$	$P2\|p_i = 1; pmtn; size_i\|\sum C_i$
$Q2\|p_i = p; pmtn; size_i\|C_{max}$	$P2\|p_i = 1; pmtn; size_i\|\sum U_i$

- **maximal open:**

$Qm\|prec; pmtn; r_i; size_i\|L_{max}$	$Rm\|pmtn; size_i\|\sum U_i$
$Rm\|pmtn; r_i; size_i\|L_{max}$	$Qm\|p_i = p; pmtn; r_i; size_i\|\sum w_iU_i$
$Q\|p_i = p; prec; pmtn; r_i; size_i\|\sum C_i$	$Qm\|p_i = p; prec; pmtn; r_i; size_i\|\sum T_i$
$P\|p_i = 1; pmtn; r_i; size_i\|\sum w_iC_i$	$Rm\|pmtn; size_i\|\sum T_i$
$Q\|p_i = p; pmtn; size_i\|\sum w_iC_i$	$Qm\|p_i = p; pmtn; r_i; size_i\|\sum w_iT_i$

Shop problems with multiprocessor tasks

- **maximal polymomially solvable:**

$FMPTm\|r_i; p_{ij} = 1\|C_{max}$	Brucker & Kraemer (1996)
$FMPTm\|r_i; p_{ij} = 1\|\sum C_i$	Brucker & Kraemer (1996)
$FMPTm\|p_{ij} = 1\|\sum w_iC_i$	Brucker & Kraemer (1996)
$FMPTm\|p_{ij} = 1\|\sum w_iU_i$	Brucker & Kraemer (1996)
$FMPTm\|prec; r_i; n = k\|\sum w_iU_i$	Kraemer (1995)
$FMPTm\|p_{ij} = 1\|\sum T_i$	Brucker & Kraemer (1996)
$FMPTm\|prec; r_i; n = k\|\sum w_iT_i$	Kraemer (1995)
$JMPT2\|n = k\|C_{max}$	Brucker & Kraemer (1995)
$JMPT\|n = 2\|\sum w_iU_i$	Brucker (1995)
$JMPT\|prec; r_i; p_{ij} = 1; n = k\|\sum w_iU_i$	Brucker & Kraemer (1996)
$JMPT\|n = 2\|\sum w_iT_i$	Brucker (1995)
$JMPT\|prec; r_i; p_{ij} = 1; n = k\|\sum w_iT_i$	Brucker & Kraemer (1996)
$OMPT2\|\|C_{max}$	Brucker & Kraemer (1995)
$OMPTm\|r_i; p_{ij} = 1\|C_{max}$	Brucker & Kraemer (1996)
$OMPTm\|r_i; p_{ij} = 1\|\sum C_i$	Brucker & Kraemer (1996)
$OMPTm\|p_{ij} = 1\|\sum w_iC_i$	Brucker & Kraemer (1996)
$OMPT\|prec; r_i; p_{ij} = 1; n = 2\|\sum w_iU_i$	Kraemer (1995)
$OMPTm\|p_{ij} = 1\|\sum w_iU_i$	Brucker & Kraemer (1996)
$OMPTm\|prec; r_i; n = k\|\sum w_iU_i$	Kraemer (1995)
$OMPTm\|p_{ij} = 1\|\sum T_i$	Brucker & Kraemer (1996)
$OMPT\|prec; r_i; p_{ij} = 1; n = 2\|\sum w_iT_i$	Kraemer (1995)
$OMPTm\|prec; r_i; n = k\|\sum w_iT_i$	Kraemer (1995)

- **minimal NP-hard:**

	$FMPT\|n = 3\|C_{max}$	Kraemer (1995)
*	$FMPT\|prec; p_{ij} = 1\|C_{max}$	Timkovsky (2003)
*	$FMPT\|tree; r_i; p_{ij} = 1\|C_{max}$	Brucker & Knust (1999)
*	$FMPT2\|\|C_{max}$	Brucker & Kraemer (1995)
*	$FMPT\|tree; p_{ij} = 1\|L_{max}$	Brucker & Knust (1999)
*	$FMPT2\|\|\sum C_i$	Garey et al. (1976)
*	$FMPT2\|chains; p_{ij} = 1\|\sum w_iC_i$	Tanaev et al. (1994)
*	$FMPT2\|chains; p_{ij} = 1\|\sum U_i$	Single-machine problem
*	$FMPT2\|chains; p_{ij} = 1\|\sum T_i$	Single-machine problem
	$JMPT3\|n = 3\|C_{max}$	Sotskov & Shakhlevich (1995)
*	$JMPT2\|p_{ij} = 1\|C_{max}$	Brucker & Kraemer (1995)
	$JMPT2\|r_i; p_{ij} = 1\|\sum C_i$	Timkovsky (1998)
	$JMPT3\|n = 3\|\sum C_i$	Sotskov & Shakhlevich (1995)
*	$JMPT2\|chains; p_{ij} = 1\|\sum C_i$	Timkovsky (1998)
*	$JMPT3\|p_{ij} = 1\|\sum C_i$	Lenstra (-)
	$JMPT2\|p_{ij} = 1\|\sum w_iC_i$	Timkovsky (1998)
*	$JMPT2\|r_i; p_{ij} = 1\|\sum w_iC_i$	Timkovsky (1998)
	$OMPT\|n = 3\|C_{max}$	Gonzalez & Sahni (1976)
	$OMPT3\|\|C_{max}$	Gonzalez & Sahni (1976)
*	$OMPT\|\|C_{max}$	Lenstra (-)
*	$OMPT\|prec; p_{ij} = 1\|C_{max}$	Timkovsky (2003)
*	$OMPT\|tree; r_i; p_{ij} = 1\|C_{max}$	Timkovsky (2003)
*	$OMPT2\|chains\|C_{max}$	Tanaev et al. (1994)
*	$OMPT2\|r_i\|C_{max}$	Lawler et al. (1981,1982)
*	$OMPT\|tree; p_{ij} = 1\|L_{max}$	Timkovsky (2003)
*	$OMPT2\|\|L_{max}$	Lawler et al. (1981,1982)
*	$OMPT2\|\|\sum C_i$	Achugbue & Chin (1982)
*	$OMPT2\|chains; p_{ij} = 1\|\sum w_iC_i$	Timkovsky (2003)
*	$OMPT\|r_i; p_{ij} = 1\|\sum U_i$	Kravchenko (1999)
*	$OMPT2\|chains; p_{ij} = 1\|\sum U_i$	Timkovsky (2003)
*	$OMPT2\|chains; p_{ij} = 1\|\sum T_i$	Timkovsky (2003)

- **minimal open:**

$FMPT\|chains;n=2\|C_{max}$	
$FMPT\|p_{ij}=1\|C_{max}$	$JMPT2\|chains;n=2\|\sum C_i$
$FMPT\|r_i;n=2\|C_{max}$	$JMPT2\|n=3\|\sum C_i$
$FMPT2\|chains;p_{ij}=1\|C_{max}$	$JMPT2\|p_{ij}=1\|\sum C_i$
$FMPT2\|r_i;p_{ij}=1\|L_{max}$	$JMPT2\|r_i;n=2\|\sum C_i$
$FMPT\|chains;n=2\|\sum C_i$	$OMPT\|n=2\|C_{max}$
$FMPT\|n=3\|\sum C_i$	$OMPT\|p_{ij}=1;n=3\|C_{max}$
$FMPT\|p_{ij}=1\|\sum C_i$	$OMPT2\|chains;p_{ij}=1\|C_{max}$
$FMPT\|r_i;n=2\|\sum C_i$	$OMPT2\|r_i;p_{ij}=1\|L_{max}$
$FMPT2\|chains;p_{ij}=1\|\sum C_i$	$OMPT\|n=2\|\sum C_i$
$FMPT2\|r_i;p_{ij}=1\|\sum w_iC_i$	$OMPT\|p_{ij}=1;n=3\|\sum C_i$
$FMPT2\|p_{ij}=1\|\sum w_iT_i$	$OMPT2\|chains;p_{ij}=1\|\sum C_i$
$JMPT2\|chains;n=2\|C_{max}$	$OMPT2\|r_i;p_{ij}=1\|\sum w_iC_i$
$JMPT2\|r_i;n=2\|C_{max}$	$OMPT2\|p_{ij}=1\|\sum w_iT_i$
$JMPT2\|n=3\|L_{max}$	

- **maximal open:**

$FMPT\|tree;p_{ij}=1\|C_{max}$	$OMPT\|tree;p_{ij}=1\|C_{max}$
$FMPT\|chains;r_i;p_{ij}=1\|L_{max}$	$OMPT\|chains;r_i;p_{ij}=1\|L_{max}$
$FMPTm\|prec;r_i;p_{ij}=1\|L_{max}$	$OMPTm\|prec;r_i;p_{ij}=1\|L_{max}$
$FMPT\|prec;r_i;p_{ij}=1\|\sum C_i$	$OMPT\|prec;r_i;p_{ij}=1\|\sum C_i$
$FMPT\|prec;r_i;n=k\|\sum w_iC_i$	$OMPT\|prec;r_i;n=k\|\sum w_iC_i$
$FMPT\|r_i;p_{ij}=1\|\sum w_iU_i$	$OMPT\|p_{ij}=1\|\sum w_iU_i$
$FMPT\|r_i;p_{ij}=1\|\sum w_iT_i$	$OMPT\|prec;r_i;n=2\|\sum w_iU_i$
$JMPT2\|p_{ij}=1\|\sum C_i$	$OMPT\|prec;r_i;p_{ij}=1;n=k\|\sum w_iU_i$
$JMPT\|prec;r_i;n=2\|\sum w_iU_i$	$OMPTm\|r_i;p_{ij}=1\|\sum w_iU_i$
$JMPT2\|prec;r_i;n=k\|\sum w_iU_i$	$OMPT\|prec;r_i;n=2\|\sum w_iT_i$
$JMPT\|prec;r_i;n=2\|\sum w_iT_i$	$OMPT\|prec;r_i;p_{ij}=1;n=k\|\sum w_iT_i$
$JMPT2\|prec;r_i;n=k\|\sum w_iT_i$	$OMPT\|r_i;p_{ij}=1\|\sum w_iT_i$

Multipurpose machine problems

- **maximal polynomially solvable:**

$QMPM\|\|\sum C_i$	Horn (1973), Bruno et al. (1974)
$PMPM\|p_i=1;r_i\|\sum w_iU_i$	Brucker et al. (1997)
$QMPM\|p_i=1\|\sum w_iU_i$	Brucker et al. (1997)
$PMPM\|p_i=1;r_i\|\sum w_iT_i$	Brucker et al. (1997)
$QMPM\|p_i=1\|\sum w_iT_i$	Brucker et al. (1997)

- **minimal NP-hard:**

	$PMPM2\|\|C_{max}$	Lenstra et al. (1977)
	$PMPM2\|chains;p_i=1\|C_{max}$	Brucker et al. (1997)
*	$PMPM\|\|C_{max}$	Garey & Johnson (1978)
*	$PMPM\|intree;p_i=1;r_i\|C_{max}$	Brucker et al. (1977)
*	$PMPM\|prec;p_i=1\|C_{max}$	Ullman (1975)
*	$PMPM2\|chains\|C_{max}$	Du et al. (1991)
*	$QMPM\|chains;p_i=1\|C_{max}$	Kubiak (1988)
*	$PMPM\|outtree;p_i=1\|L_{max}$	Brucker et al. (1977)
*	$PMPM\|prec;p_i=1\|\sum C_i$	Lenstra & Rinnooy Kan (1978)
*	$PMPM2\|chains\|\sum C_i$	Du et al. (1991)
*	$PMPM2\|r_i\|\sum C_i$	Single-machine problem
	$PMPM2\|\|\sum w_iC_i$	Bruno et al. (1974)
*	$PMPM\|\|\sum w_iC_i$	Lenstra (-)
*	$PMPM2\|chains;p_i=1\|\sum w_iC_i$	Timkovsky (1998)
*	$PMPM2\|chains;p_i=1\|\sum U_i$	Single-machine problem
*	$PMPM2\|chains;p_i=1\|\sum T_i$	Single-machine problem

- **minimal open:**

$QMPM2|p_i=1;r_i|C_{max}$
$PMPM2|chains;p_i=1|\sum C_i$
$QMPM2|p_i=1;r_i|\sum C_i$

- **maximal open:**

$QMPM|tree;p_i=1;r_i|\sum C_i$
$QMPMm|prec;p_i=1;r_i|\sum C_i$
$QMPM|p_i=1;r_i|\sum w_iU_i$
$QMPM|p_i=1;r_i|\sum w_iT_i$

Shop problems with multipurpose machines

- **maximal polymomially solvable:**

$FMPMm \mid r_i; p_{ij} = 1 \mid C_{max}$	Brucker et al. (1997)
$FMPMm \mid r_i; p_{ij} = 1 \mid \sum C_i$	Brucker et al. (1997)
$FMPMm \mid p_{ij} = 1 \mid \sum w_i C_i$	Brucker et al. (1997)
$FMPMm \mid p_{ij} = 1 \mid \sum w_i U_i$	Brucker et al. (1997)
$FMPMm \mid prec; r_i; n = k \mid \sum w_i U_i$	Brucker (1995)
$FMPMm \mid p_{ij} = 1 \mid \sum T_i$	Brucker et al. (1997)
$FMPMm \mid prec; r_i; n = k \mid \sum w_i T_i$	Brucker (1995)
$JMPM \mid prec; r_i; n = 2 \mid L_{max}$	Jurisch (1995)
$JMPM \mid prec; r_i; p_{ij} = 1; n = k \mid \sum w_i U_i$	Brucker et al. (1997)
$JMPM \mid prec; r_i; p_{ij} = 1; n = k \mid \sum w_i T_i$	Brucker et al. (1997)
$OMPMm \mid r_i; p_{ij} = 1 \mid C_{max}$	Brucker et al. (1997)
$OMPMm \mid r_i; p_{ij} = 1 \mid \sum C_i$	Brucker et al. (1997)
$OMPMm \mid p_{ij} = 1 \mid \sum w_i C_i$	Brucker et al. (1997)
$OMPMm \mid p_{ij} = 1 \mid \sum w_i U_i$	Brucker et al. (1997)
$OMPMm \mid prec; r_i; n = k \mid \sum w_i U_i$	Brucker (1995)
$OMPMm \mid p_{ij} = 1 \mid \sum T_i$	Brucker et al. (1997)
$OMPMm \mid prec; r_i; n = k \mid \sum w_i T_i$	Brucker (1995)

- **maximal pseudopolymomially solvable:**

$JMPM2 \mid n = 3 \mid C_{max}$	Jurisch (1995) , Meyer (1992)
$OMPM \mid p_{ij} = 1 \mid C_{max}$	Jurisch (1995)

- **minimal NP-hard:**

	$FMPM \mid n = 3 \mid C_{max}$	Brucker et al. (1997)
	$FMPM2 \mid\mid C_{max}$	Lenstra et al. (1977)
*	$FMPM \mid intree; r_i; p_{ij} = 1 \mid C_{max}$	Brucker et al. (1977)
*	$FMPM \mid prec; p_{ij} = 1 \mid C_{max}$	Ullman (1975)
*	$FMPM2 \mid chains \mid C_{max}$	Lenstra et al. (1977)
*	$FMPM2 \mid r_i \mid C_{max}$	Lenstra et al. (1977)
*	$FMPM3 \mid\mid C_{max}$	Garey et al. (1976)
*	$FMPM \mid outtree; p_{ij} = 1 \mid L_{max}$	Brucker et al. (1977)
*	$FMPM2 \mid\mid L_{max}$	Lenstra et al. (1977)
*	$FMPM \mid prec; p_{ij} = 1 \mid \sum C_i$	Lenstra & Rinnooy Kan (1978)
*	$FMPM2 \mid\mid \sum C_i$	Garey et al. (1976)
*	$FMPM2 \mid chains; p_{ij} = 1 \mid \sum w_i C_i$	Tanaev et al. (1994)
*	$FMPM2 \mid chains; p_{ij} = 1 \mid \sum U_i$	Single-machine problem
*	$FMPM2 \mid chains; p_{ij} = 1 \mid \sum T_i$	Single-machine problem
	$JMPM2 \mid n = 3 \mid C_{max}$	Jurisch (1995) , Meyer (1992)
*	$JMPM2 \mid chains; p_{ij} = 1 \mid C_{max}$	Timkovsky (1985)
*	$JMPM3 \mid p_{ij} = 1 \mid C_{max}$	Lenstra & Rinnooy Kan (1979)
	$JMPM2 \mid r_i; p_{ij} = 1 \mid \sum C_i$	Timkovsky (1998)
	$JMPM3 \mid n = 3 \mid \sum C_i$	Sotskov & Shakhlevich (1995)
*	$JMPM2 \mid chains; p_{ij} = 1 \mid \sum C_i$	Timkovsky (1998)
*	$JMPM3 \mid p_{ij} = 1 \mid \sum C_i$	Lenstra (-)
	$JMPM2 \mid p_{ij} = 1 \mid \sum w_i C_i$	Timkovsky (1998)
*	$JMPM2 \mid r_i; p_{ij} = 1 \mid \sum w_i C_i$	Timkovsky (1998)
	$JMPM2 \mid r_i; p_{ij} = 1 \mid \sum U_i$	Timkovsky (1998)
	$JMPM2 \mid p_{ij} = 1 \mid \sum w_i U_i$	Kravchenko (1999A)
*	$JMPM2 \mid p_{ij} = 1 \mid \sum w_i T_i$	Timkovsky (1998)

	$OMPM \mid n=3 \mid C_{max}$	Gonzalez & Sahni (1976)
	$OMPM3 \mid\mid C_{max}$	Gonzalez & Sahni (1976)
*	$OMPM \mid\mid C_{max}$	Lenstra (-)
*	$OMPM \mid outtree; r_i; p_{ij}=1 \mid C_{max}$	Timkovsky (2003)
*	$OMPM \mid prec; p_{ij}=1 \mid C_{max}$	Timkovsky (2003)
*	$OMPM2 \mid chains \mid C_{max}$	Tanaev et al. (1994)
*	$OMPM2 \mid r_i \mid C_{max}$	Lawler et al. (1981,1982)
*	$OMPM \mid outtree; p_{ij}=1 \mid L_{max}$	Timkovsky (2003)
*	$OMPM2 \mid\mid L_{max}$	Lawler et al. (1981,1982)
*	$OMPM2 \mid\mid \sum C_i$	Achugbue & Chin (1982)
*	$OMPM \mid prec; p_{ij}=1 \mid \sum C_i$	Lenstra & Rinnooy Kan (1978)
*	$OMPM2 \mid chains; p_{ij}=1 \mid \sum w_i C_i$	Timkovsky (2003)
*	$OMPM \mid r_i; p_{ij}=1 \mid \sum U_i$	Kravchenko (1999)
*	$OMPM2 \mid chains; p_{ij}=1 \mid \sum U_i$	Timkovsky (2003)
*	$OMPM2 \mid chains; p_{ij}=1 \mid \sum T_i$	Timkovsky (2003)

- **minimal open:**

$FMPM \mid p_{ij}=1 \mid C_{max}$		
$FMPM2 \mid chains; p_{ij}=1 \mid C_{max}$	$JMPM2 \mid p_{ij}=1 \mid C_{max}$	$OMPM2 \mid chains; p_{ij}=1 \mid C_{max}$
$FMPM2 \mid r_i; p_{ij}=1 \mid L_{max}$	$JMPM2 \mid n=2 \mid \sum C_i$	$OMPM2 \mid r_i; p_{ij}=1 \mid L_{max}$
$FMPM \mid n=2 \mid \sum C_i$	$JMPM2 \mid p_{ij}=1 \mid \sum C_i$	$OMPM \mid p_{ij}=1; n=2 \mid \sum C_i$
$FMPM \mid p_{ij}=1 \mid \sum C_i$	$JMPM2 \mid n=2 \mid \sum U_i$	$OMPM \mid p_{ij}=1; n=3 \mid \sum C_i$
$FMPM2 \mid chains; p_{ij}=1 \mid \sum C_i$	$OMPM \mid p_{ij}=1; n=2 \mid C_{max}$	$OMPM2 \mid chains; p_{ij}=1 \mid \sum C_i$
$FMPM2 \mid r_i; p_{ij}=1 \mid \sum w_i C_i$	$OMPM \mid p_{ij}=1; n=3 \mid C_{max}$	$OMPM2 \mid r_i; p_{ij}=1 \mid \sum w_i C_i$
$FMPM \mid n=2 \mid \sum U_i$	$OMPM2 \mid\mid C_{max}$	$OMPM2 \mid p_{ij}=1 \mid \sum w_i T_i$
$FMPM2 \mid p_{ij}=1 \mid \sum w_i T_i$		

- **maximal open:**

$FMPM \mid outtree; r_i; p_{ij}=1 \mid C_{max}$	
$FMPM \mid tree; p_{ij}=1 \mid C_{max}$	$OMPM \mid tree; p_{ij}=1 \mid C_{max}$
$FMPM \mid chains; r_i; p_{ij}=1 \mid L_{max}$	$OMPM2 \mid\mid C_{max}$
$FMPM \mid intree; p_{ij}=1 \mid L_{max}$	$OMPM \mid intree; r_i; p_{ij}=1 \mid L_{max}$
$FMPMm \mid prec; r_i; p_{ij}=1 \mid L_{max}$	$OMPMm \mid prec; r_i; p_{ij}=1 \mid L_{max}$
$FMPM \mid tree; r_i; p_{ij}=1 \mid \sum C_i$	$OMPM \mid tree; r_i; p_{ij}=1 \mid \sum C_i$
$FMPMm \mid prec; r_i; p_{ij}=1 \mid \sum C_i$	$OMPMm \mid prec; r_i; p_{ij}=1 \mid \sum C_i$
$FMPM \mid prec; r_i; n=k \mid \sum w_i C_i$	$OMPM \mid prec; r_i; n=k \mid \sum w_i C_i$
$FMPM \mid r_i; p_{ij}=1 \mid \sum w_i U_i$	$OMPM \mid p_{ij}=1 \mid \sum w_i U_i$
$FMPM \mid r_i; p_{ij}=1 \mid \sum w_i T_i$	$OMPM \mid prec; r_i; n=2 \mid \sum w_i U_i$
$JMPM2 \mid r_i; p_{ij}=1 \mid L_{max}$	$OMPM \mid prec; r_i; p_{ij}=1; n=k \mid \sum w_i U_i$
$JMPM2 \mid prec; r_i; n=k \mid \sum w_i C_i$	$OMPMm \mid r_i; p_{ij}=1 \mid \sum w_i U_i$
$JMPM2 \mid p_{ij}=1 \mid \sum U_i$	$OMPM \mid prec; r_i; n=2 \mid \sum w_i T_i$
$JMPM \mid prec; r_i; n=2 \mid \sum w_i U_i$	$OMPM \mid prec; r_i; p_{ij}=1; n=k \mid \sum w_i T_i$
$JMPM2 \mid p_{ij}=1 \mid \sum T_i$	$OMPM \mid r_i; p_{ij}=1 \mid \sum w_i T_i$
$JMPM \mid prec; r_i; n=2 \mid \sum w_i T_i$	

Serial batching problems

- **maximal polynomially solvable:**

$1\|prec; s-batch\|L_{max}$	Ng et al. (2002)
$1\|prec; p_i = p; s-batch\|\sum C_i$	Albers & Brucker (1993)
$1\|s-batch\|\sum C_i$	Coffman et al. (1990)
$1\|p_i = p; s-batch; r_i\|\sum w_iC_i$	Baptiste (2000A)
$1\|s-batch\|\sum U_i$	Brucker & Kovalyov (1996)
$1\|p_i = p; s-batch; r_i\|\sum w_iU_i$	Baptiste (2000A)
$1\|p_i = p; s-batch; r_i\|\sum T_i$	Baptiste (2000A)

- **maximal pseudopolynomially solvable:**

$1\|s-batch\|\sum w_iU_i$	Brucker & Kovalyov (1996), Karp (1972)
$1\|s-batch\|\sum T_i$	Du & Leung (1990), Baptiste & Jouglet (2001)

- **minimal NP-hard:**

*	$1\|s-batch; r_i\|L_{max}$	Lenstra et al. (1977)
	$1\|chains; s-batch\|\sum C_i$	Albers & Brucker (1993)
*	$1\|prec; s-batch\|\sum C_i$	Lawler (1978), Lenstra & Rinnooy Kan (1978)
*	$1\|s-batch; r_i\|\sum C_i$	Lenstra et al. (1977)
*	$1\|chains; p_i = 1; s-batch\|\sum w_iC_i$	Albers & Brucker (1993)
*	$1\|s-batch\|\sum w_iC_i$	Albers & Brucker (1993)
*	$1\|chains; p_i = 1; s-batch\|\sum U_i$	Lenstra & Rinnooy Kan (1980)
	$1\|s-batch\|\sum w_iU_i$	Brucker & Kovalyov (1996), Karp (1972)
	$1\|s-batch\|\sum T_i$	Du & Leung (1990), Baptiste & Jouglet (2001)
*	$1\|chains; p_i = 1; s-batch\|\sum T_i$	Leung & Young (1990)

- **minimal open:**

$1|chains; p_i = 1; s-batch; r_i|L_{max}$
$1|chains; p_i = 1; s-batch; r_i|\sum C_i$
$1|p_i = 1; s-batch|\sum w_iT_i$

- **maximal open:**

$1|prec; p_i = p; s-batch; r_i|L_{max}$
$1|prec; p_i = p; s-batch; r_i|\sum C_i$
$1|p_i = p; s-batch; r_i|\sum w_iT_i$

Parallel batching problems

- **maximal polynomially solvable:**

$1\|outtree; p_i = p; p-batch; r_i; b < n\|C_{max}$	Parallel machine problem
$1\|p-batch; b < n\|C_{max}$	Brucker et al. (1998)
$1\|tree; p_i = p; p-batch; b < n\|C_{max}$	Parallel machine problem
$1\|chains; p_i = 1; p-batch; r_i; b < n\|L_{max}$	Parallel machine problem
$1\|intree; p_i = p; p-batch; b < n\|L_{max}$	Parallel machine problem
$1\|outtree; p_i = 1; p-batch; r_i; b < n\|\sum C_i$	Parallel machine problem
$1\|tree; p_i = p; p-batch; b < n\|\sum C_i$	Parallel machine problem
$1\|p-batch\|\sum w_iC_i$	Brucker et al. (1998)
$1\|p_i = p; p-batch; r_i; b < n\|\sum w_iC_i$	Baptiste (2000A)
$1\|p-batch\|\sum U_i$	Brucker et al. (1998)
$1\|p_i = p; p-batch; r_i; b < n\|\sum w_iU_i$	Baptiste (2000A)
$1\|prec; p_i = p; p-batch\|\sum w_iU_i$	Earliest Start Schedule
$1\|p_i = p; p-batch; r_i; b < n\|\sum T_i$	Baptiste (2000A)
$1\|p_i = 1; p-batch; r_i; b < n\|\sum w_iT_i$	Parallel machine problem
$1\|p_i = p; p-batch; b < n\|\sum w_iT_i$	Parallel machine problem
$1\|p_i = p; p-batch; r_i\|\sum w_iT_i$	Baptiste et al. (2004)
$1\|prec; p_i = p; p-batch\|\sum w_iT_i$	Earliest Start Schedule

- **maximal pseudopolynomially solvable:**

$1\|p-batch; r_i\|\sum w_iU_i$	Baptiste et al. (2004)
$1\|p-batch; r_i\|\sum w_iT_i$	Baptiste et al. (2004)

- **minimal NP-hard:**

*	$1\|intree; p_i = 1; p-batch; r_i; b < n\|C_{max}$	Parallel machine problem
*	$1\|p-batch; r_i; b < n\|C_{max}$	Brucker et al. (1998)
*	$1\|prec; p_i = 1; p-batch; b < n\|C_{max}$	Parallel machine problem
*	$1\|outtree; p_i = 1; p-batch; b < n\|L_{max}$	Parallel machine problem
*	$1\|p-batch; b < n\|L_{max}$	Brucker et al. (1998)
*	$1\|intree; p_i = 1; p-batch; r_i; b < n\|\sum C_i$	Parallel machine problem
*	$1\|p-batch; r_i; b < n\|\sum C_i$	Single machine problem
*	$1\|prec; p_i = 1; p-batch; b < n\|\sum C_i$	Parallel machine problem
*	$1\|chains; p_i = 1; p-batch; b < n\|\sum w_iC_i$	Parallel machine problem
*	$1\|chains; p_i = 1; p-batch; b < n\|\sum U_i$	Single machine problem
	$1\|p-batch\|\sum w_iU_i$	Brucker et al. (1998)
*	$1\|chains; p_i = 1; p-batch; b < n\|\sum T_i$	Single machine problem
	$1\|p-batch\|\sum w_iT_i$	Brucker et al. (1998)

- **minimal open:**

$1|chains; p-batch|C_{max}$
$1|intree; p_i = 1; p-batch; r_i|C_{max}$
$1|p-batch; r_i|C_{max}$
$1|chains; p_i = p; p-batch; r_i|L_{max}$
$1|outtree; p_i = 1; p-batch; r_i|L_{max}$
$1|chains; p-batch|\sum C_i$
$1|chains; p_i = p; p-batch; r_i|\sum C_i$
$1|intree; p_i = 1; p-batch; r_i|\sum C_i$
$1|p-batch; b < n|\sum C_i$
$1|p-batch; r_i|\sum C_i$
$1|chains; p_i = 1; p-batch; r_i|\sum w_iC_i$
$1|chains; p_i = 1; p-batch; r_i|\sum U_i$
$1|chains; p_i = 1; p-batch; r_i|\sum T_i$
$1|p-batch|\sum T_i$
$1|p_i = p; p-batch; r_i; b < n|\sum w_iT_i$

- **maximal open:**

$1|tree; p-batch; b < n|C_{max}$
$1|chains; p_i = p; p-batch; r_i; b < n|L_{max}$
$1|outtree; p_i = p; p-batch; r_i; b < n|\sum C_i$
$1|tree; p-batch; b < n|\sum C_i$
$1|p-batch; b < n|\sum w_iC_i$
$1|prec; p-batch; r_i|\sum w_iC_i$
$1|prec; p-batch; r_i|\sum U_i$
$1|prec; p_i = p; p-batch; r_i|\sum w_iU_i$
$1|prec; p-batch; r_i|\sum T_i$
$1|p_i = p; p-batch; r_i; b < n|\sum w_iT_i$
$1|prec; p_i = p; p-batch; r_i|\sum w_iT_i$

Single machine problems with non-negative time-lags

- **maximal polynomially solvable:**

$1\|chains(l); p_i = p\|C_{max}$	Munier & Sourd (2003)
$1\|outtree(l); p_i = 1; r_i\|C_{max}$	Bruno et al. (1980)
$1\|prec(1)\|C_{max}$	Finta & Liu (1996)
$1\|prec; r_i\|C_{max}$	Lawler (1973)
$1\|tree(l); p_i = 1\|C_{max}$	Bruno et al. (1980)
$1\|intree(l); p_i = 1\|L_{max}$	Bruno et al. (1980)
$1\|prec\|L_{max}$	Lawler (1973)
$1\|prec(1); p_i = 1; r_i\|L_{max}$	Bruno et al. (1980)
$1\|prec; p_i = p; r_i\|L_{max}$	Simons (1978)
$1\|chains(l); p_i = p\|\sum C_i$	Brucker et al. (2006)
$1\|outtree(l); p_i = 1; r_i\|\sum C_i$	Brucker & Knust (1999)
$1\|prec(1); p_i = 1; r_i\|\sum C_i$	Baptiste & Timkovsky (2004)
$1\|prec; p_i = p; r_i\|\sum C_i$	Simons (1983)
$1\|p_i = p; r_i\|\sum w_iC_i$	Baptiste (2000)
$1\|sp-graph\|\sum w_iC_i$	Lawler (1978)
$1\|\|\sum U_i$	Moore (1968), Maxwell (1970), Sidney (1973)
$1\|p_i = p; r_i\|\sum w_iU_i$	Baptiste (1999)
$1\|p_i = p; r_i\|\sum T_i$	Baptiste (2000)
$1\|p_i = 1; r_i\|\sum w_iT_i$	Assignment-problem
$1\|p_i = p\|\sum w_iT_i$	Assignment-problem

- **maximal pseudopolynomially solvable:**

$1\|\|\sum w_iU_i$	Lawler & Moore (1969), Karp (1972)
$1\|\|\sum T_i$	Lawler (1977), Du & Leung (1990)

- **minimal NP-hard:**

*	$1\|chains(l)\|C_{max}$	Wikum et al. (1994)
*	$1\|chains(l_{ij}); p_i = 1\|C_{max}$	Yu (1996), Yu et al. (2004)
*	$1\|intree(l); p_i = 1; r_i\|C_{max}$	Brucker & Knust (1999)
*	$1\|prec(l); p_i = 1\|C_{max}$	Leung et al. (1984), Timkovsky (2003)
*	$1\|outtree(l); p_i = 1\|L_{max}$	Brucker & Knust (1999)
*	$1\|r_i\|L_{max}$	Lenstra et al. (1977)
*	$1\|chains(l)\|\sum C_i$	Brucker & Knust (1999)
*	$1\|prec\|\sum C_i$	Lawler (1978), Lenstra & Rinnooy Kan (1978)
*	$1\|r_i\|\sum C_i$	Lenstra et al. (1977)
*	$1\|chains(1); p_i = 1\|\sum w_iC_i$	Tanaev et al. (1994)
*	$1\|chains; p_i = 1; r_i\|\sum w_iC_i$	Lenstra & Rinnooy Kan (1980)
*	$1\|prec; p_i = 1\|\sum w_iC_i$	Lawler (1978), Lenstra & Rinnooy Kan (1978)
*	$1\|chains; p_i = 1\|\sum U_i$	Lenstra & Rinnooy Kan (1980)
	$1\|\|\sum w_iU_i$	Lawler & Moore (1969), Karp (1972)
	$1\|\|\sum T_i$	Lawler (1977), Du & Leung (1990)
*	$1\|chains; p_i = 1\|\sum T_i$	Leung & Young (1990)
*	$1\|\|\sum w_iT_i$	Lawler (1977), Lenstra et al. (1977)

- **minimal open:**

$1\|chains(1); p_i = p; r_i\|C_{max}$	$1\|chains(l_{ij}); p_i = 1\|\sum C_i$
$1\|intree(l); p_i = p\|C_{max}$	$1\|intree(1); p_i = 1; r_i\|\sum C_i$
$1\|outtree(l); p_i = p\|C_{max}$	$1\|intree(1); p_i = p\|\sum C_i$
$1\|chains(1); p_i = p\|L_{max}$	$1\|intree(l); p_i = 1\|\sum C_i$
$1\|chains(l); p_i = 1; r_i\|L_{max}$	$1\|outtree(1); p_i = p\|\sum C_i$
$1\|chains(1)\|\sum C_i$	$1\|p_i = p; r_i\|\sum w_iT_i$
$1\|chains(1); p_i = p; r_i\|\sum C_i$	

- **maximal open:**

$1\|outtree(l); p_i = p; r_i\|C_{max}$	$1\|prec(1)\|L_{max}$
$1\|prec(1); r_i\|C_{max}$	$1\|prec(1); p_i = p; r_i\|L_{max}$
$1\|tree(l); p_i = p\|C_{max}$	$1\|prec(l_{ij}); p_i = p; r_i\|\sum C_i$
$1\|chains(l); p_i = p; r_i\|L_{max}$	$1\|tree(1)\|\sum C_i$
$1\|intree(l); p_i = p\|L_{max}$	$1\|p_i = p; r_i\|\sum w_iT_i$

Flow-shop problems with transportation delays

- **maximal polynomially solvable:**

$F2\|p_{ij}=1; t_i \in \{T_1, T_2\}\|C_{max}$	Yu (1996)
$F2\|t_{ik}=T\|C_{max}$	Johnson (1954)
$F\|p_{ij}=1; t_i\|\sum C_i$	Brucker et al. (2004)
$F\|p_{ij}=1; t_k; r_i\|\sum w_i U_i$	Single-machine problem
$F\|p_{ij}=1; t_k; r_i\|\sum w_i T_i$	Single-machine problem

- **minimal NP-hard:**

* $F2\|p_{ij}=1; t_i\|C_{max}$	Yu (1996), Yu et al. (2004)
* $F2\|r_i\|C_{max}$	Lenstra et al. (1977)
* $F2\|t_i \in \{T_1, T_2\}\|C_{max}$	Yu (1996)
* $F3\|\|C_{max}$	Garey et al. (1976)
* $F2\|\|L_{max}$	Lenstra et al. (1977)
* $F2\|\|\sum C_i$	Garey et al. (1976)
* $F2\|p_{ij}=1; t_i; r_i\|\sum C_i$	Brucker et al. (2004)
* $F2\|p_{ij}=1; t_i\|\sum w_i C_i$	Brucker et al. (2004)

- **minimal open:**

$F2|p_{ij}=1; t_i \in \{T_1, T_2\}; r_i|C_{max}$
$F3|p_{ij}=1; t_i \in \{T_1, T_2\}|C_{max}$
$F2|p_{ij}=1; t_i \in \{T_1, T_2\}|L_{max}$
$F2|p_{ij}=1; t_i \in \{T_1, T_2\}; r_i|\sum C_i$
$F3|p_{ij}=1; t_i \in \{T_1, T_2\}; r_i|\sum C_i$
$F3|p_{ij}=1; t_{ik}|\sum C_i$
$F2|p_{ij}=1; t_i \in \{T_1, T_2\}|\sum w_i C_i$
$F3|p_{ij}=1; t_i \in \{T_1, T_2\}|\sum w_i C_i$

- **maximal open:**

$F|p_{ij}=1; t_{ik}|\sum C_i$
$F|p_{ij}=1; t_i \in \{T_1, T_2\}; r_i|\sum w_i U_i, \sum w_i T_i$
$F3|p_{ij}=1; t_{ik}; r_i|\sum w_i U_i, \sum w_i T_i$

Open-shop problems with transportation delays

- **maximal polynomially solvable:**

$O\|p_{ij}=1;t_{ikl}=T\|C_{max}$	Rayward-Smith & Rebaine (1992)
$O2\|\|C_{max}$	Gonzalez & Sahni (1976)
$O2\|p_{ij}=1;t_{ikl}=T;r_i\|C_{max}$	Brucker et al. (2004)
$O2\|p_{ij}=1;t_{kl}\|C_{max}$	Knust (1999), Brucker et al. (2004)
$O\|p_{ij}=1;r_i\|L_{max}$	Brucker et al. (1993), Networkflowproblem
$Om\|p_{ij}=1;r_i\|\sum C_i$	Tautenhahn & Woeginger (1997)
$O\|p_{ij}=1\|\sum w_iC_i$	Brucker et al. (1993)
$O2\|p_{ij}=1;t_{kl}\|\sum w_iC_i$	Brucker et al. (2004)
$O\|p_{ij}=1\|\sum U_i$	Liu & Bulfin (1988)
$O2\|p_{ij}=1;t_{ikl}=T\|\sum U_i$	Brucker et al. (2004)
$Om\|p_{ij}=1;r_i\|\sum w_iU_i$	Baptiste (2003)
$O\|p_{ij}=1\|\sum T_i$	Liu & Bulfin (1988)

- **minimal NP-hard:**

	$O2\|t_{ikl}=T\|C_{max}$	Yu (1996)
	$O3\|\|C_{max}$	Gonzalez & Sahni (1976)
*	$O\|\|C_{max}$	Lenstra (-)
*	$O\|p_{ij}=1;t_{kl}=t_{lk}\|C_{max}$	Rayward-Smith & Rebaine (1992)
*	$O2\|p_{ij}=1;t_i\|C_{max}$	Yu (1996), Yu et al. (2004)
*	$O2\|r_i\|C_{max}$	Lawler et al. (1981,1982)
*	$O2\|t_i\in\{T_1,T_2\}\|C_{max}$	Yu (1996)
*	$O2\|\|L_{max}$	Lawler et al. (1981,1982)
*	$O2\|\|\sum C_i$	Achugbue & Chin (1982)
*	$O2\|p_{ij}=1;t_i;r_i\|\sum C_i$	Brucker et al. (2004)
*	$O2\|p_{ij}=1;t_i\|\sum w_iC_i$	Brucker et al. (2004)
*	$O\|p_{ij}=1;r_i\|\sum U_i$	Kravchenko (1999)

- **minimal open:**

$O2\|p_{ij}=1;t_i\in\{T_1,T_2\}\|C_{max}$	$O3\|p_{ij}=1;t_{ikl}=T\|L_{max}$	$O\|p_{ij}=1\|\sum w_iU_i$
$O2\|p_{ij}=1;t_{kl};r_i\|C_{max}$	$O\|p_{ij}=1;r_i\|\sum C_i$	$O2\|p_{ij}=1;t_{ikl}=T\|\sum w_iU_i$
$O3\|p_{ij}=1;t_i\in\{T_1,T_2\}\|C_{max}$	$O2\|p_{ij}=1;t_i\in\{T_1,T_2\}\|\sum C_i$	$O2\|p_{ij}=1;r_i\|\sum T_i$
$O3\|p_{ij}=1;t_{ikl}=T;r_i\|C_{max}$	$O2\|p_{ij}=1;t_{ikl}=T;r_i\|\sum C_i$	$O2\|p_{ij}=1;t_{ikl}=T\|\sum T_i$
$O3\|p_{ij}=1;t_{kl}=t_{lk}\|C_{max}$	$O3\|p_{ij}=1;t_{ikl}=T\|\sum C_i$	$O3\|p_{ij}=1;r_i\|\sum T_i$
$O2\|p_{ij}=1;t_{ikl}=T;r_i\|L_{max}$	$O2\|p_{ij}=1;r_i\|\sum w_iC_i$	$O2\|p_{ij}=1\|\sum w_iT_i$
$O2\|p_{ij}=1;t_{kl}\|L_{max}$	$O3\|p_{ij}=1;r_i\|\sum w_iC_i$	$O3\|p_{ij}=1\|\sum w_iT_i$

- **maximal open:**

$O\|p_{ij}=1;t_{ikl}\|\sum C_i$	$Om\|p_{ij}=1;t_{kl};r_i\|\sum w_iU_i$
$O\|p_{ij}=1;t_{kl};r_i\|\sum w_iC_i$	$O\|p_{ij}=1;t_i\in\{T_1,T_2\};r_i\|\sum w_iT_i$
$O\|p_{ij}=1;t_i\in\{T_1,T_2\}\|\sum w_iU_i$	$O3\|p_{ij}=1;t_{ikl};r_i\|\sum w_iT_i$
$O3\|p_{ij}=1;t_{ikl};r_i\|\sum w_iU_i$	$Om\|p_{ij}=1;t_{kl};r_i\|\sum w_iT_i$
$Om\|p_{ij}=1;t_i\in\{T_1,T_2\};r_i\|\sum w_iU_i$	

Flow-shop problems with transportation times and a single robot

- **maximal polynomially solvable:**

$F2\|\|C_{max}$	Johnson (1954)
$F2;R1\|p_{ij}=1;t_i\|C_{max}$	Hurink & Knust (2001)
$F2;R1\|p_{ij}=p;t_i\in\{T_1,T_2\}\|C_{max}$	Hurink & Knust (2001)
$F3;R1\|p_{ij}=1;t_k;r_i\|C_{max}$	Baptiste et al. (2004)
$F;R1\|n\geq m-1;p_{ij}=p;t_k\|C_{max}$	Hurink & Knust (2001)
$F3;R1\|p_{ij}=1;t_k\|L_{max}$	Baptiste et al. (2004)
$F\|p_{ij}=p;r_i\|\sum w_iC_i$	Single-machine problem
$F2;R1\|p_{ij}=p;t_{ik}=T;r_i\|\sum w_iC_i$	Knust (1999)
$F\|p_{ij}=p;r_i\|\sum w_iU_i$	Single-machine problem
$F2;R1\|p_{ij}=p;t_{ik}=T;r_i\|\sum w_iU_i$	Knust (1999)
$F\|p_{ij}=p;r_i\|\sum T_i$	Single-machine problem
$F2;R1\|p_{ij}=p;t_{ik}=T;r_i\|\sum T_i$	Knust (1999)
$F\|p_{ij}=1;r_i\|\sum w_iT_i$	Single-machine problem
$F\|p_{ij}=p\|\sum w_iT_i$	Single-machine problem
$F2;R1\|p_{ij}=p;t_{ik}=T\|\sum w_iT_i$	Knust (1999)

- **minimal NP-hard:**

*	$F2\|r_i\|C_{max}$	Lenstra et al. (1977)
*	$F2;R1\|p_{ij}=p;t_i\|C_{max}$	Hurink & Knust (2001)
*	$F2;R1\|t_{ik}=T\|C_{max}$	Kise (1991), Hurink & Knust (2001)
*	$F3\|\|C_{max}$	Garey et al. (1976)
*	$F3;R1\|p_{ij}=p;t_{ik};r_i\|C_{max}$	Knust (1999)
*	$F2\|\|L_{max}$	Lenstra et al. (1977)
*	$F2;R1\|p_{ij}=1;t_i;r_i\|L_{max}$	Knust (1999)
*	$F3;R1\|p_{ij}=1;t_{ik};r_i\|L_{max}$	Knust (1999)
*	$F3;R1\|p_{ij}=p;t_{ik}\|L_{max}$	Knust (1999)
*	$F2\|\|\sum C_i$	Garey et al. (1976)
*	$F2;R1\|p_{ij}=1;t_i;r_i\|\sum C_i$	Knust (1999)
*	$F3;R1\|p_{ij}=1;t_{ik};r_i\|\sum C_i$	Knust (1999)
	$F2;R1\|p_{ij}=1;t_i\|\sum w_iU_i$	Knust (1999)
	$F3;R1\|p_{ij}=1;t_{ik}\|\sum w_iU_i$	Knust (1999)
	$F2;R1\|p_{ij}=1;t_i\|\sum T_i$	Knust (1999)
	$F3;R1\|p_{ij}=1;t_{ik}\|\sum T_i$	Knust (1999)
*	$F2;R1\|p_{ij}=1;t_i\|\sum w_iT_i$	Knust (1999)
*	$F3;R1\|p_{ij}=1;t_{ik}\|\sum w_iT_i$	Knust (1999)

- **minimal open:**

$F2;R1\|p_{ij}=1;t_i\in\{T_1,T_2\};r_i\|C_{max}$	$Fm;R1\|p_{ij}=1;t_{ik}=T\|L_{max}$
$F3;R1\|p_{ij}=1;t_i\in\{T_1,T_2\}\|C_{max}$	$F2;R1\|p_{ij}=1;t_i\in\{T_1,T_2\}\|\sum C_i$
$F3;R1\|p_{ij}=p;t_{ik}=T;r_i\|C_{max}$	$F3;R1\|p_{ij}=1;t_{ik}=T\|\sum C_i$
$Fm;R1\|p_{ij}=1;t_{ik}=T;r_i\|C_{max}$	$F3;R1\|p_{ij}=1;t_{ik}=T\|\sum U_i$
$F2;R1\|p_{ij}=1;t_i\in\{T_1,T_2\}\|L_{max}$	$F2\|p_{ij}=p;r_i\|\sum w_iT_i$
$F3;R1\|p_{ij}=1;t_{ik}=T;r_i\|L_{max}$	$F2;R1\|p_{ij}=1;t_{ik}=T;r_i\|\sum w_iT_i$
$F3;R1\|p_{ij}=p;t_{ik}=T\|L_{max}$	$F3\|p_{ij}=p;r_i\|\sum w_iT_i$

- **maximal open:**

$F3;R1\|p_{ij}=p;t_{ik}\|C_{max}$	$F;R1\|p_{ij}=p;t_i\in\{T_1,T_2\};r_i\|\sum w_iU_i$
$F;R1\|p_{ij}=1;t_{ik};r_i\|C_{max}$	$F;R1\|p_{ij}=p;t_k;r_i\|\sum w_iU_i$
$F;R1\|p_{ij}=p;t_{ik}\|\sum w_iC_i$	$F3;R1\|p_{ij}=p;t_i;r_i\|\sum w_iT_i$
$F;R1\|p_{ij}=1;t_{ik}\|\sum U_i$	$F;R1\|p_{ij}=p;t_i\in\{T_1,T_2\};r_i\|\sum w_iT_i$
$F3;R1\|p_{ij}=p;t_i;r_i\|\sum w_iU_i$	$F;R1\|p_{ij}=p;t_k;r_i\|\sum w_iT_i$

Parallel machine problems with a single server

- **maximal polynomially solvable:**

$P;S1\|s_i = s; p_i = p; r_i\|C_{max}$	Brucker et al. (2002B)
$P\|\|\sum C_i$	Bruno et al. (1974)
$P2;S1\|s_i = 1\|\sum C_i$	Hall et al. (2000)
$P;S1\|s_i = s; p_i = p; r_i\|\sum C_i$	Brucker et al. (2002B)
$P;S1\|p_i = 1\|\sum w_iC_i$	Hall et al. (2000)
$P;S1\|s_i = s; p_i = 1; r_i\|\sum w_iC_i$	Brucker et al. (2002B)
$P\|p_i = p; r_i\|\sum w_iC_i$	Brucker & Kravchenko (2008)
$P;S1\|p_i = 1\|\sum U_i$	Hall et al. (2000)
$P;S1\|s_i = s; p_i = 1; r_i\|\sum w_iU_i$	Brucker et al. (2002B)
$Pm\|p_i = p; r_i\|\sum w_iU_i$	Baptiste et al. (2004)
$P;S1\|s_i = s; p_i = p\|\sum w_iU_i$	Assignment problem
$P;S1\|s_i = s; p_i = 1; r_i\|\sum T_i$	Brucker et al. (2002B)
$P\|p_i = p; r_i\|\sum T_i$	Brucker & Kravchenko (2005)
$P\|p_i = 1; r_i\|\sum w_iT_i$	Networkflowproblem
$P;S1\|s_i = 1; p_i = 1; r_i\|\sum w_iT_i$	Assignment problem
$P;S1\|s_i = s; p_i = p\|\sum w_iT_i$	Assignment problem

- **maximal pseudopolynomially solvable:**

$P2;S1\|s_i = 1\|C_{max}$	Hall et al. (2000), Kravchenko & Werner (1997)
$Pm\|r_i\|C_{max}$	Lawler et al. (1989)
$Pm\|\|\sum w_iC_i$	Lawler et al. (1989)
$P2;S1\|p_i = 1\|\sum w_iU_i$	Single-machine problem, Hall et al. (2000)
$Pm\|\|\sum w_iU_i$	Lawler et al. (1989)
$P2;S1\|p_i = 1\|\sum T_i$	Single-machine problem, Hall et al. (2000)

- **minimal NP-hard:**

	$P2\|\|C_{max}$	Lenstra et al. (1977)
	$P2;S1\|p_i = p\|C_{max}$	Brucker et al. (2002B)
*	$P\|\|C_{max}$	Garey & Johnson (1978)
*	$P2;S1\|s_i = s\|C_{max}$	Hall et al. (2000)
*	$P2;S1\|p_i = 1; r_i\|L_{max}$	Single-machine problem, Brucker et al. (2002B)
*	$P2;S1\|s_i = 1\|L_{max}$	Hall et al. (2000)
	$P2;S1\|p_i = p\|\sum C_i$	Brucker et al. (2002B)
*	$P2\|r_i\|\sum C_i$	Single-machine problem
*	$P2;S1\|p_i = 1; r_i\|\sum C_i$	Single-machine problem, Brucker et al. (2002B)
*	$P2;S1\|s_i = s\|\sum C_i$	Hall et al. (2000)
*	$P;S1\|s_i = 1\|\sum C_i$	Brucker et al. (2002B)
	$P2\|\|\sum w_iC_i$	Bruno et al. (1974)
*	$P\|\|\sum w_iC_i$	Lenstra (-)
	$P2;S1\|p_i = 1\|\sum w_iU_i$	Single-machine problem, Hall et al. (2000)
	$P2;S1\|p_i = 1\|\sum T_i$	Single-machine problem, Hall et al. (2000)
*	$P2;S1\|p_i = 1\|\sum w_iT_i$	Single-machine problem, Hall et al. (2000)

- **minimal open:**

$P2;S1|p_i = 1; r_i|C_{max}$
$P2;S1|s_i = 1; p_i = p; r_i|L_{max}$
$Pm;S1|s_i = 1|\sum C_i$
$P2;S1|s_i = 1; p_i = p; r_i|\sum w_iC_i$
$P|p_i = p; r_i|\sum U_i$
$P2|p_i = p; r_i|\sum w_iT_i$
$P2;S1|s_i = s; p_i = 1; r_i|\sum w_iT_i$

- **maximal open:**

$P;S1|p_i = 1; r_i|C_{max}$
$Pm;S1|s_i = 1|\sum C_i$
$P;S1|s_i = s; p_i = p; r_i|\sum w_iU_i$
$P;S1|s_i = s; p_i = p; r_i|\sum w_iT_i$

Flow-shop problems with a single server

- **maximal polynomially solvable:**

$F2\|\|C_{max}$	Johnson (1954)
$F2;S1\|p_{ij}=p;s_{ij}=s;r_i\|C_{max}$	Brucker et al. (2005)
$F;S1\|p_{ij}=1;s_{ij}=s;r_i\|C_{max}$	Brucker et al. (2005)
$F;S1\|p_{ij}=p;s_{ij}=s\|C_{max}$	Brucker et al. (2005)
$F2;S1\|p_{ij}=p;s_{ij}=s;r_i\|\sum C_i$	Brucker et al. (2005)
$F;S1\|p_{ij}=1;s_{ij}=s;r_i\|\sum C_i$	Brucker et al. (2005)
$F\|p_{ij}=p;r_i\|\sum w_iC_i$	Single-machine problem
$F2;S1\|p_{ij}=p;s_{ij}=1;r_i\|\sum w_iC_i$	Single-machine problem
$F\|p_{ij}=p;r_i\|\sum w_iU_i$	Single-machine problem
$F2;S1\|p_{ij}=p;s_{ij}=1;r_i\|\sum w_iU_i$	Single-machine problem
$F2;S1\|p_{ij}=p;s_{ij}=s\|\sum w_iU_i$	Assignment problem
$F;S1\|p_{ij}=1;s_{ij}=s\|\sum w_iU_i$	Assignment problem
$F\|p_{ij}=p;r_i\|\sum T_i$	Single-machine problem
$F2;S1\|p_{ij}=p;s_{ij}=1;r_i\|\sum T_i$	Single-machine problem
$F\|p_{ij}=1;r_i\|\sum w_iT_i$	Single-machine problem
$F\|p_{ij}=p\|\sum w_iT_i$	Single-machine problem
$F2;S1\|p_{ij}=p;s_{ij}=s\|\sum w_iT_i$	Assignment problem
$F;S1\|p_{ij}=1;s_{ij}=s\|\sum w_iT_i$	Assignment problem

- **minimal NP-hard:**

	$F2;S1\|p_{ij}=p\|C_{max}$	Brucker et al. (2005)
*	$F2\|r_i\|C_{max}$	Lenstra et al. (1977)
*	$F2;S1\|s_{ij}=s\|C_{max}$	Brucker et al. (2005)
*	$F3\|\|C_{max}$	Garey et al. (1976)
*	$F2\|\|L_{max}$	Lenstra et al. (1977)
*	$F2;S1\|p_{ij}=1;r_i\|L_{max}$	Brucker et al. (2005)
*	$F3;S1\|p_{ij}=1;r_i\|L_{max}$	Brucker et al. (2005)
*	$F2\|\|\sum C_i$	Garey et al. (1976)
*	$F2;S1\|p_{ij}=1;r_i\|\sum C_i$	Brucker et al. (2005)
*	$F3;S1\|p_{ij}=1;r_i\|\sum C_i$	Brucker et al. (2005)
	$F2;S1\|p_{ij}=1\|\sum w_iU_i$	Brucker et al. (2005)
	$F3;S1\|p_{ij}=1\|\sum w_iU_i$	Brucker et al. (2005)
	$F2;S1\|p_{ij}=1\|\sum T_i$	Brucker et al. (2005)
	$F3;S1\|p_{ij}=1\|\sum T_i$	Brucker et al. (2005)
*	$F2;S1\|p_{ij}=1\|\sum w_iT_i$	Brucker et al. (2005)
*	$F3;S1\|p_{ij}=1\|\sum w_iT_i$	Brucker et al. (2005)

- **minimal open:**

$F2;S1\|p_{ij}=1\|C_{max}$	$F3;S1\|p_{ij}=1;s_{ij}=1;r_i\|L_{max}$	$F2;S1\|p_{ij}=1;s_{ij}=s;r_i\|\sum w_iC_i$
$F2;S1\|s_{ij}=1\|C_{max}$	$F3;S1\|p_{ij}=p;s_{ij}=1\|L_{max}$	$F3;S1\|p_{ij}=1;s_{ij}=1;r_i\|\sum w_iC_i$
$F3;S1\|p_{ij}=1\|C_{max}$	$F2;S1\|p_{ij}=1\|\sum C_i$	$F2\|p_{ij}=p;r_i\|\sum w_iT_i$
$F3;S1\|p_{ij}=p;s_{ij}=1;r_i\|C_{max}$	$F3;S1\|p_{ij}=1\|\sum C_i$	$F2;S1\|p_{ij}=1;s_{ij}=1;r_i\|\sum w_iT_i$
$F2;S1\|p_{ij}=1;s_{ij}=s;r_i\|L_{max}$	$F3;S1\|p_{ij}=p;s_{ij}=1\|\sum C_i$	$F3\|p_{ij}=p;r_i\|\sum w_iT_i$

- **maximal open:**

$F2;S1\|s_{ij}=1\|C_{max}$	$F3;S1\|p_{ij}=p\|\sum U_i$
$F3;S1\|p_{ij}=p;r_i\|C_{max}$	$F;S1\|p_{ij}=1\|\sum U_i$
$F;S1\|p_{ij}=1;r_i\|C_{max}$	$F;S1\|p_{ij}=p;s_{ij}=s;r_i\|\sum w_iU_i$
$F;S1\|p_{ij}=p\|\sum w_iC_i$	$F;S1\|p_{ij}=p;s_{ij}=s;r_i\|\sum w_iT_i$
