Table 7-1 SUMMARY of RESEARCH on JOB-SHOP (STATIC) SCHEDULING PROBLEMS

	OBJECTIVE FUNCTION	ASSUMPTIONS ETC.	SINGLE STAGE		TWO STAGES	THREE STAGES	M STAGES (M ≥ 3)
			SETUP TIME INCLUDED	SETUP TIME GIVEN SEPERATELY			
WITH DUE DATES	A.(1) Tardiness Minimize: (Max. Tardiness)		Combinational Analysis *Smith (1956)*				
	(2) Minimize: Total Tardiness						Combinational Analysis. Branch and Bound Technique *Brooks and White (1965)*
	B. Waiting Time (1) Minimize: Sum of waiting times (Minimize: Sum of completion times)	Case (1) All jobs are equal in importance	Combinational Analysis *Smith (1956)*		Combinational Analysis *Ignall and Schrage (1965)*		
		Case (2) All jobs are equal in importance Restriction: each job must be completed by due date	Combinational Analysis *Smith (1956)*				
	(2) Minimize: Weighted sum of completion times.	Case (1) Each job has a priority number	Combinational Analysis *Smith (1956)*				
		Case (2) Each job has a priority number Restriction: each job must be completed by due date	Combinational Analysis *Smith (1956)*				
	C. Penalty Cost Minimize: Total penalty cost.	Case (1) Linear loss function	Combinational Analysis *Mc Naughton (1959)* *Schild and Fredman (1961)*				
		Case (2) Non-linear loss function	Combinational Analysis *Schild and Fredman (1961)*				
WITHOUT DUE DATES	D. Elapsed Time Minimize: Total elapsed time	Case (1) a) Jobs can be split b) Different machines are available for same operation. Their efficiencies are not same.	Combinational Analysis 3 jobs in 2 machines *Mc Naughton (1959)* Linear programming model: N jobs in M machines *P. Ramalingam (1969)*				
		Case (2) Jobs cannot be split.	Trivial: (all solutions are optimal)	1) Combinational Analysis (Traveling Salesman Problem - Branch and Bound method) *Little et. al. (1963)*	1) Combinational Analysis *Johnson (1954)*	1) Combinational Analysis (Restricted case) *Johnson (1954)*	1) Combinational Analysis A) Matrix Method Case 1) Open scheduling Case 2) Dual-open scheduling Case 3) Mixed scheduling *Giffler and Thompson (1960)* B) Linear and Monte-Carlo Algorithms Case 1) Open Scheduling Case 2) Dual-open scheduling Case 3) Mixed scheduling *Giffler and Thompson (1960)* C) Branch and Bound Technique application *Brooks and White (1965)* *Ignall and Schrage (1965)* D) *Dudex and Teuton (1964)* 2) Geometric Model: Case 1) 2 jobs *Akers (1956)* Case 2) j (≥ 2) jobs *Hardgrave and Nemhauser (1963)* 3) Programming A) Linear programming *Dantzig (1960)* B) Integer Linear Programming *Bowman (1959)* *Manne (1960)* *Wagner (1959)*
				2) Combinational Analysis (Heuristic Rules) *Gavett (1965)* Open path case *P. Ramalingam (1969)*	2) Combinational Analysis Jobs with start and stop time lags Case (1) Start lag = Stop lag Case (2) Start lag ≠ Stop lag *Mitten (1959, 1959)* 3) Combinational Analysis for Job-lots *Jackson (1956)*	2) Heuristic rules: (Integer Linear Programs, Linear Programs, and Combinational Methods) *Giglo and Wagner (1964)*	
	E. In-process inventory cost. Minimize: Total in-process inventory cost						Combinational Analysis *Gapp et. al. (1965)*
	F. Total Cost (Storage plus production costs)						1) Transportation Method *Bowman (1956)* 2) Combinational Analysis *Johnson (1957)* 3) Combinational Analysis (Satisfying the available manhours - only feasible solutions) *Vazsonyi (1957, 1958)*
	G. Testing Cost Minimize: Total testing cost.						Combinational Analysis *Mitten (1960)* *Maukekar and Mitten (1965)* *Johnson (1956)*