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LIST OF SYMBOLS

Symbol	Meaning
$\tilde{A}$	a fuzzy judgment matrix
A_i	a number of machines used by part ‘ *i* ’ only
A_{js}	a number of acceptance card
a_{ij}	an actual value of the *i*th alternative in terms of the *j*th criterion
B_j	a number of machines used by part ‘ *j* ’ only
C_{js}	an amount of each job contribution
d	an ordinate of the highest intersection point
$d_j^{\min}$	a minimal delivery time
g	the objective function
h	a pre-specified desired half width
h_0	the half width from initial replications
$I(t)$	1 at the specified interval, 0 otherwise
I	1 if the decision rule is satisfied and equals 0 otherwise
J	a set of all existing jobs
K	a number of components
$\tilde{L}_{st}^D$	workload norms at station *s*
l	a lower value of the support of M
M_i^j	triangular fuzzy numbers
m	a modal(mid) value
N	a number of criteria
N_i^k	a feasible neighborhood of ant
n	a size of the matrix

n	a number of jobs
n_0	a number of initial replications
O_s^{*D}	a maximum output of station *s* during the planned station throughput time
p_{js}	a processing time of job *j* at station *s*
R_i	a rank of the *i*th alternative
S_{ij}	a basis of the pair-wise similarity coefficients
T_i^f	the floor time
T_i^l	the lead time
T_i^p	the pool time
T_j^{*P}	an estimated waiting time in the order pool
T_s^{*D}	planned value at station *s*
t_{js}^C	a time of completion of job *j* at station *s*
t_j^R	the times of release of job *j*
U_{js}	a set of stations in the routing of *j* "up to and including" station *s*
u	an upper value of the support of M
V_i	a fuzzy eigen vector
W	a nonfuzzy number
$\tilde{W}$	a weight vector
$W_{i.j}^{k,l}$	relative weights of element *i* at layer *j* with respect to element *k* at layer *l*.
w_j	a weight or importance of the *j*th criterion
w_{ij}	a consistent judgment ratio formed from the priority vector $\boldsymbol{w} = (w_1, w_2, \ldots, w_n)$ computed from $\boldsymbol{A} = [a_{ij}]_{m \times n}$ and $y_{ij} = ln(a_{ij}/w_{ij})$
X_{ij}	a number of machines used by both part ' *i* ' and part ' *j* '
x_i	observed variables
x_{jm}	a level of criteria *m* for choice alternative *j*

Y_{ij}	a number of machines that are used neither by part ‘ i ’ nor by part ‘ j ’
y_m	the smallest level of the attribute
ρ	the pheromone evaporation rate
σ^2	the variance of error
σ_X^2	the variance of the observed total test scores
$\sigma_{w_i}^2$	the variance of the local weight
$\sigma_{Y_j}^2$	the variance of component i for the current sample of persons
$\sigma_{i,j}^{k,l}$	standard deviation of element i at layer j with respect to element k at layer l
ξ_i	latent variables or common factors
δ_i	unique factors
δ_i	the due date
λ_{ij}	factor loadings
λ_{max}	a reference index to screen information for a consistency ratio (CR) calculation of the estimated vector
Φ_{ij}	factor variance and covariance
Θ	error variance and covariance
ϕ	the vector of input parameters
γ_i	the tardy delivery date
ϑ_i	the early delivery date
τ_{ij}	an initial pheromone trails
η_{ij}	a heuristic value
α	the relative influence of the pheromone trail
β	the heuristic information

LIST OF ABBREVIATIONS

Abbreviation	Meaning
ACO	Ant colony optimization
AHP	Analytic hierarchy process
ANP	Analytical network process
AS	Ant system
C.I.	Confidence interval
CFA	Confirmatory factor analysis
CNC	Computerized numerical control
Cobacabana	Control of balance by card-based navigation
CONWIP	Constant work in process
CR	Consistency ratio
DM	Decision maker
EDD	Earliest due date
EFA	Exploratory factor analysis
ELECTRE	Elimination and choice translating reality
FAHP	Fuzzy analytical hierarchy process
FMRG	Fast multiple recursive generator
FPC	Flow process chart
FST	Fuzzy set theory
GDP	Gross domestic product
HVLV	High variety, low volume
IDEF	Integrated definition for function modeling
MCDM	Multiple criteria decision making
MMPPC	Modified multiple-product process
MPPC	Multiple-product process chart
MTO	Make-to-order

MTS	Make-to-stock
PC	Product cost
POLCA	Paired-cell overlapping loops of cards with authorization
PQ	Product quantity
PWSC	Pair-wise similarity coefficients
SEM	Structure equation model
SMEs	Small and medium enterprises
TFN	Triangular fuzzy number
TOPSIS	Technique for order preference by similarity to ideal solution
VNM	Value network mapping
WCM	World class manufacturing
WLC	Workload control