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Attending Fuzzy Transit Issues Using Centroid Of Centroids Technique

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Abstract

In today's world, we are frequently confronted with situations of unreliability and unwillingness as a result of different unmanageable components. Multiple studies have advocated the intuitionistic fuzzy (IF) delineation for material to deal with unreliability and reluctance. This paper proposes a method for solving these transportation problems using generalised trapezoidal intuitionistic fuzzy numbers, in which capacity and demand are treated as real numbers, and the cost of transportation from origin to destination is treated as a charge of product per unit using generalised trapezoidal intuitionistic fuzzy numbers. On the basis of IFN's centroid of centroids, the generalised trapezoidal intuitionistic fuzzy numbers ranking function is applied. We develop the primary basic feasible solution and the foremost solution using the traditional optimization procedure. The numerical demonstration demonstrates the efficacy of the suggested strategy. Using the ranking function of a fuzzy TP of generalised trapezoidal intuitionistic fuzzy number, a new technique is used to get the best solution. This approach expressly provides the best answer for GTrIFTP without the need for an IBFS. Finally, for the ranking function, we use a proposed GTrIFTP approach, which is demonstrated numerically.

Keywords: trapezoidal intuitionistic fuzzy; intuitionistic fuzzy (IF); Centroids

1. Introduction

Fuzzy set (FS) theory was first invented by Zadeh [11] has been involved <u>effective</u> in different fields. The concept fuzzy mathematical programming was invented by Tanaka et al in 1947 the framework of fuzzy decision of Bellman et al [2].The concept of Intuitionistic fuzzy sets (IFS‟s) suggested by Atanassov [1] is found to be hugely useful to deal with ambiguity. The IFS‟s separate proportion integration (fulfillment level) and proportion non-participation (non-fulfillment level) of an element in the set. IFS‟s assist constrained to agree proportion fulfillment, proportion of non-fulfillment and proportion of uncertainty for consignment and assist to mould decision about intensity of approval and non-approval for TC in any TP. Owing upon execution of IFS theory enhance fit attractive in regulating obstacles. Consequently keen exceed to avail IFS in contrast with FS to review unfaithfulness. In Ismail Mohideen et al [4], look over a relative swot on TP in fuzzy domain. Stephen et al. [6] investigated a method to solve fuzzy transportation problem (FTP) by taking trapezoidal fuzzy numbers. So, many authors used IFS‟s in different regenerate obstacles. Chakraborty et al. [3] introduced computational operations of IFS‟s. Multiple researchers further devised with IFS‟s. Intuitionistic trapezoidal fuzzy numbers are introduced in Wang et al. [10], which are extending of intuitionistic triangular fuzzy numbers. Intuitionistic triangular fuzzy numbers and intuitionistic trapezoidal fuzzy numbers are extending of intuitionistic fuzzy sets in another way, which extends discrete set to continuous set, and they are extending of fuzzy numbers. Intuitionistic trapezoidal fuzzy weighted arithmetic averaging operators and weighted geometric averaging operators are introduced by Wang et al. [8][9]. PardhaSaradhi et al. [5] defined ordering of IFN‟s using centroid of centroids of IFN. We extended above paper [5] by assuming transportation problem. However assumed TP is solved by using proposed method.

Rest of article is organized as follows: Section 2 Preliminaries deals with some basic definitions, section 3 provides Ranking function of GTrIFN, section 4 deals with mathematical formulation and proposed method, section 5consists Numerical example, finally conclusion is given in section 6.

2. Preliminaries

In this segment a few preliminaries and computations are discussed.

Intuitionistic Fuzzy Set (IFS):

An IFS $\hat{A}$ in X is detailed as object of following form

$$\tilde{A}^{IFS} = \{ \langle x, \mu_{\tilde{A}^{IFS}}(x), \nu_{\tilde{A}^{IFS}}(x) \rangle : x \in X \}$$

where the functions $\mu_{\tilde{A}^{IFS}} : X \to [0$ and $\nu_{\tilde{A}^{IFS}} : X \to [0$ define intensity of integration function and the non-membership of element x respectively and $0 \leq \mu_{\tilde{A}^{IFS}}(x), \nu_{\tilde{A}^{IFS}}(x)$ for every x

Intuitionistic Fuzzy Numbers (IFN's): A subset of IFS, $\tilde{A}^{IFS} = \{ \langle x, \mu_{\tilde{A}^{IFS}}(x), \nu_{\tilde{A}^{IFS}}(x) \rangle : x \in$, of real line is called an IFN if following holds:

(i) $\exists m \in \Re, \mu_{\tilde{A}^{IFS}}(m) = 1 \, and \, \nu_{\tilde{A}^{IFS}}(m) = 0$

(ii) $\mu_{\tilde{A}^{IFS}} : \Re \to [0, 1]$ is continuous and for every $x \in \Re, 0 \leq \mu_{\tilde{A}^{IFS}}(x), \nu_{\tilde{A}^{IFS}}(x) \leq 1$ holds.

The membership function and non-membership function of $\hat{A}$ is demonstrated,

$$\mu_{\tilde{A}^{IFS}}(x) = \begin{cases} f_1(x), & x \in [m - \alpha_1, \\ 1, & x = m \\ h_1(x), & x \in (m, m + \\ 0, & otherwise \end{cases} \quad \text{and} \quad \nu_{\tilde{A}^{IFS}}(x) = \begin{cases} 1, & x \in (-\infty, m - \alpha_2 \\ f_2(x), & x \in [m - \alpha_2, m) \\ 0, & x = m, x \in [m + \beta_2, \\ h_2(x), & x \in (m, m + \beta_2] \end{cases}$$

Where f_i and $h_i(x)$; $i =$ are strictly increasing and decreasing functions in $[m - \alpha_i,$ and $(m, m -$ respectively. α_i and β_i are the left and right spreads of $\mu_{\tilde{A}^{IFS}}$ and $\nu_{\tilde{A}^{IFS}}$ respectively.

Trapezoidal Intuitionistic Fuzzy Number (TrIFN): An IFN $\tilde{A}^{TrIFS} = \langle (a_1, a_2, a_3, a_4)(a_1', a_2, a_3, a_4') \rangle$ is a TrIFN in $\Re$ with the following membership function $\mu_{\tilde{A}}$ and non-membership function $\nu_{\tilde{A}}$ defined by

$$\mu_{\tilde{A}^{IFS}}(x) = \begin{cases} 0 & x < a_1 \\ \dfrac{x-a_1}{a_2-a_1} & a_1 < x < a_2 \\ 1 & a_2 < x < a_3 \\ \dfrac{x-a_4}{a_3-a_4} & a_3 < x < a_4 \\ 0 & a_4 < x \end{cases} \quad \text{and} \quad \upsilon_{\tilde{A}^{IFS}}(x) = \begin{cases} 0 & x < a_1' \\ \dfrac{x-a_2}{a_1'-a_2} & a_1' < x < a_2 \\ 0 & a_2 < x < a_3 \\ \dfrac{x-a_3}{a_3-a_4'} & a_3 < x < a_4' \\ 1 & a_4' < x \end{cases}$$

Generalized TrIFN (GTrIFN): An IFN $\tilde{A}^{IFS} = \langle (a_1, a_2, a_3, a_4; \omega_a)(a_1', a_2, a_3, a_4'; \sigma_a) \rangle$ claimed to be a GTrIFN if its integration and non-membership consequence are respectively liable

$$\mu_{\tilde{A}^{IFS}}(x) = \begin{cases} 0 & \text{if } x < a_1 \\ \dfrac{(x-a_1)\omega_a}{a_2-a_1} & \text{if } a_1 < x < a_2 \\ \omega_a & \text{if } a_2 < x < a_3 \\ \dfrac{(x-a_4)\omega_a}{a_3-a_4} & \text{if } a_3 < x < a_4 \\ 0 & \text{if } a_4 < x \end{cases} \quad \text{and} \quad \upsilon_{\tilde{A}^{IFS}}(x) = \begin{cases} 0 & \text{if } x < a_1' \\ \dfrac{x-a_2-\sigma_a(a_1'-x)}{a_1'-a_2} & \text{if } a_1' < x < a_2 \\ \sigma_a & \text{if } a_2 < x < a_3 \\ \dfrac{a_3-x-\sigma_a(x-a_4')}{a_3-a_4'} & \text{if } a_3 < x < a_4' \\ 1 & \text{if } a_4' < x \end{cases}$$

Where ω_a and σ_a constitute extreme intensity of integration and minimal intensity of non-membership sequentially, gratifying $0 \le \omega_a \le 1, 0 \le \sigma_a \le 1, 0 \le \omega_a + \sigma_a \le 1$. Graphical representation of GTrIFN is illustrated in Fig.1.

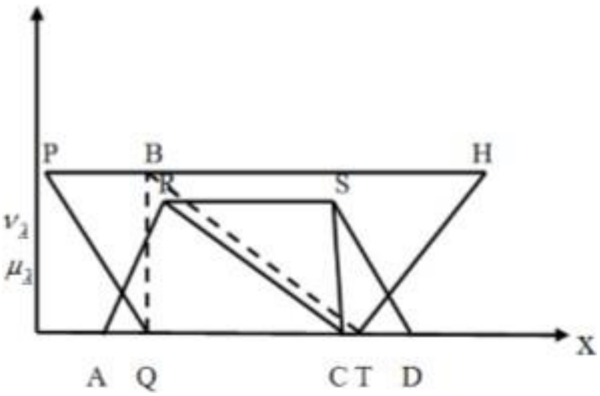

Fig 1: GTrIFN graph

Arithmetic operations of GTrIFN:

For any two TrIFN's

$\tilde{A}^{TrIFN} = \langle (a_1, a_2, a_3, a_4; \omega_a)(a'_1, a_2, a_3, a'_4; \sigma_a) \rangle$ and

$\tilde{B}^{TrIFN} = \langle (b_1, b_2, b_3, b_4; \omega_b)(b'_1, b_2, b_3, b'_4; \sigma_b) \rangle$ the arithmetic operations are as follows,

(i) GTrIFN's Addition:

$$\tilde{A}^{GTrIFN} \oplus \tilde{B}^{GTrIFN} = \left\langle \begin{matrix} (a_1 + b_1, a_2 + b_2, a_3 + b_3, a_4 + b_4; \min(\omega_a, \omega_b)) \\ (a'_1 + b'_1, a_2 + b_2, a_3 + b_3, a'_4 + b'_4; \max(\sigma_a, \sigma_b)) \end{matrix} \right\rangle$$

(ii) GTrIFN's Subtraction:

$$\tilde{A}^{GTrIFN} - \tilde{B}^{GTrIFN} = \left\langle \begin{matrix} (a_1 - b_4, a_2 - b_2, a_3 - b_3, a_4 - b_1; \min(\omega_a, \omega_b)) \\ (a'_1 - b'_4, a_2 - b_2, a_3 - b_3, a'_4 - b'_1; \max(\sigma_a, \sigma_b)) \end{matrix} \right\rangle$$

(iii) Scalar Multiplication:

$$k \times \tilde{A}^{GTrIFN} = \left\langle \begin{matrix} (ka_1, ka_2, ka_3, ka_4; \omega_a)(ka'_1, ka_2, ka_3, ka'_4; \sigma_a) \text{ if } k > 0 \\ (ka_4, ka_3, ka_2, ka_1; \omega_a)(ka'_4, ka_3, ka_2, ka'_1; \sigma_a) \text{ if } k > 0 \end{matrix} \right\rangle$$

3. Ranking Function of GTrIFN

Definition: Let the GTrIFN be $\tilde{A}^{TrIFN} = \langle (a_1, a_2, a_3, a_4; \omega_a)(b_1, b_2, b_3, b_4; \omega_a) \rangle$ ranking function of a GTrIFN can be taken from Pardha Saradhi et al. [5] is

$$R(\tilde{A}^{TrIFN}) = \left(\frac{a_1 + b_1 + 2(a_2 + b_3) + 5(a_3 + b_2) + a_4 + b_4}{18} \right) \left(\frac{4\omega_a + 5\omega_b}{18} \right)$$

$Ex:$ Let $\tilde{A}^{GTrIFN} = \langle (2, 7, 11, 15; 0.5)(1, 7, 11, 18; 0.3) \rangle$ $then$

$$R(\tilde{A}^{GTrIFN}) = \left(\frac{2 + 1 + 2(7 + 11) + 5(11 + 7) + 15 + 18}{18} \right) \left(\frac{4(0.5) + 5(0.3)}{18} \right)$$
$$= 1.75$$

Comparison of GTrIFN's:

In order to compare GTrIFN's with every one obliged to grade. An assignment comparable $R: F(\Re) \rightarrow$, which depict each TIFN's amongst existent rule, is called ranking function. At this moment, $F($ signify inclined GTrIFN's.

By using the ranking function "R", GTrIFN's can be compared.

Let $\tilde{A}^{TrIFN} = \langle (a_1, a_2, a_3, a_4; \omega_a)(a'_1, a_2, a_3, a'_4; \sigma_a) \rangle$ and $\tilde{B}^{TrIFN} = \langle (b_1, b_2, b_3, b_4; \omega_b)(b'_1, b_2, b_3, b'_4; \sigma_b) \rangle$ are two GTrIFN's then

$$R(\tilde{A}^{TrIFN}) = \left(\frac{a_1 + a_1' + 2(a_2 + a_3') + 5(a_3 + a_2') + a_4 + a_4}{18}\right)\left(\frac{4\omega_a + 5\sigma_a}{18}\right) \; and$$

$$R(\tilde{B}^{TrIFN}) = \left(\frac{b_1 + b_1' + 2(b_2 + b_3') + 5(b_3 + b_2') + b_4 + b_4'}{18}\right)\left(\frac{4\omega_b + 5\sigma_b}{18}\right)$$

Subsequently series circumscribed as

(i) $\tilde{A}^{TrIFN} > \tilde{B}^{TrIFN}$ if $R\left(\tilde{A}^{TrIFN}\right) > R\left(\tilde{B}^{TrIFN}\right)$,

(ii) $\tilde{A}^{TrIFN} < \tilde{B}^{TrIFN}$ if $R\left(\tilde{A}^{TrIFN}\right) < R\left(\tilde{B}^{TrIFN}\right)$, and (iii) $\tilde{A}^{TrIFN} = \tilde{B}^{TrIFN}$ if $R\left(\tilde{A}^{TrIFN}\right) = R\left(\tilde{B}^{TrIFN}\right)$

Ranking function R confine the following possessions:

(i) $R\left(\tilde{A}^{TrIFN}\right) + R\left(\tilde{B}^{TrIFN}\right) = R\left(\tilde{A}^{TrIFN} + \tilde{B}^{TrI,}\right.$ (ii) $R\left(k\tilde{A}^{TrIFN}\right) = k\,R\left(\tilde{A}^{TrIFN}\right) \forall k$

4. Mathematical Formulation of Trapezoidal Intuitionistic Fuzzy Transportation problem:

In TP decision maker or magnificent temporize abounding aspect over spanning in order through dealer and requirement. Occasionally decision maker is in decisive substantially more aggregate of peculiar commodity accessible at repository at peculiar time unlike intention. To this extent, he has not transmit to his associate or heis uncertain that how often aggregate of peculiar commodity credibly fabricate according to accessible primal matter by peculiar time. Uniformly, he may temporize from requirement. Intendedly new commodity eventually instigates in a market then he cannot decide exact aggregate of this commodity should transit to a peculiar terminus. Perhaps owing to unfamiliarity of the customers about this commodity or difference in cost and efficacy of commodity to similar one. We employ IFNs to deal with hesitation and uncertainty.

Appraise a TP with 'm' inceptions and 'n' terminus. Let c_{ij} be cost of transiting one unit of commodity from inception to the terminus.

Let $\tilde{a}_i^{GTrIFN} = (a_1^i, a_2^i, a_3^i, a_4^i, \omega_a; a_1^{i'}, a_2^i, a_3^i, a_4^{i'}, \sigma_a)$ be the IF quantity available at the origin.

$\tilde{b}_j^{GTrIFN} = (b_1^j, b_2^j, b_3^j, b_4^j, \omega_b; b_1^{j'}, b_2^j, b_3^j, b_4^{j'}, \sigma_b)$ be the IF quantity needed at the destination. $\tilde{x}_{ij}^{GTrIFN} = (x_1^{ij}, x_2^{ij}, x_3^{ij}, x_4^{ij}; x_1^{ij'}, x_2^{ij}, x_3^{ij}, x_4^{ij'})$ be the IF quantity transformed from the origin to the destination. Then the balanced generalized trapezoidal intuitionistic fuzzy transportation problem is given by

$$Min\,\tilde{Z}^{GTrIFN} = \sum_{i=1}^{m}\sum_{j=1}^{n} c_{ij} \times x_{ij}$$

$$s.t. \quad \sum_{j=1}^{n} \tilde{x}_{ij}^{GTrIFN} \le \tilde{a}_i^I, i = 1, 2, \ldots, m$$

$$\sum_{i=1}^{m} \tilde{x}_{ij}^{GTrIFN} \ge \tilde{b}_i^I, j = 1, 2, \ldots, n$$

$$\tilde{x}_{ij}^{GTrIFN} \ge \tilde{0}; \; i = 1, 2, \ldots, m; \; j = 1, 2, \ldots, n$$

Proposed Transportation strategy

Preferred method is elementary and prompt strategy to seek prime solution $\{x_{ij}\}$ including intuitionistic fuzzy optimal value $\tilde{Z}^{GTrIFN}$ of TP having repository including demand limitations as real number and TC, $\tilde{c}_{ij}^{GTrIFN}; (i = 1, 2, \ldots, m; j = 1, 2, \ldots, n)$ from i^{th} source to j^{th} requirement, extract IFN represented in Table 1.

Table 1 GrIFTP

	D_1	D_2	⋯	D_n	Supply (s_i)
S_1	$\tilde{c}_{11}^{GTrIFN}$	$\tilde{c}_{12}^{GTrIFN}$	⋯	$\tilde{c}_{1n}^{GTrIFN}$	s_1
S_2	$\tilde{c}_{21}^{GTrIFN}$	$\tilde{c}_{22}^{GTrIFN}$		$\tilde{c}_{2n}^{GTrIFN}$	s_2
. . .	. . .	. . .	⋯ ⋯ ⋯	. . .	. . .
S_m	$\tilde{c}_{m1}^{GTrIFN}$	$\tilde{c}_{m2}^{GTrIFN}$		$\tilde{c}_{mn}^{GTrIFN}$	s_m
Demand (d_j)	d_1	d_2	⋯	d_n	$\sum_{i=1}^{m} s_i = \sum_{j=1}^{d} d_j$

Stage 1: Utilizing separation formula, considered in "Comparison of IFTN"s" segment, adopt least and greatest IFN from each archive and segment of intuitionistic fuzzy price matrix of TIFTP of type-2 and deduct it from each IFN"s of their relating line and segment.

Stage 2: Find sum of row difference and column difference and denote row sum by R and column sum by C. Identify Maximum sum of row and column. Select maximum difference in row and column.

Stage 3: Choose the cell having most minimal expense in row and column identified in stage 2. Stage 4: Make a feasible assignment to the cell picked in stage 5. Delete fulfilled row/column. Stage 5: Repeat the technique until all the designations has been made.
Stage 6: The Optimum solution and triangular intuitionistic optimum value is attained in stage 8, is optimum solution {} and t triangular intuitionistic fuzzy optimum value is $\sum_{i=1}^{m} \sum_{j=1}^{n} c_{ij} \otimes$

5. Numerical Examples:

In this unit, a prevailed numerical example is resolved to instance proposed generalized trapezoidalintuitionistic fuzzy zero centred method.

Example 1: An existing Generalized trapezoidal Intuitionistic fuzzy transportation problem (GTrIFTP), with three repositories i.e. S_1, S_2, S_3 including three demands i.e., D_1, D_2, D_3 respectively by Table 2 taken fromShashi et al. [7], is resolved using proposed Transportation strategy.

Table 2 GTrIFTP

	D_1	D_2	D_3	Supply
S_1	(2,4,8,15; 0.6)(1,4,8,18: 0.3)	(3,5,7,12; 0.5)(1,5,7,15; 0.3)	(2,5,9,16; 0.7)(1,5,9,18; 0.3)	25
S_2	(2,5,8,10; 0.6)(1,5,8,12; 0.2)	(4,8,10,13; 0.4)(3,8,10,15; 0.3)	(3,6,10,15; 0.8)(2,6,10,18; 0.2)	30
S_3	(2,7,11,15; 0.5)(1,7,11,18; 0.3)	(5,9,12,16; 0.7)(3,9,12,19; 0.2)	(4,6,8,10; 0.6)(3,6,8,12; 0.3)	40
Demand	35	45	15	

Solution: Problem is resolved in the following stages

Select maximum and minimum TIFN in each row and column take the difference as given in table 3.

Table 3 Row and Column difference table

	D_1	D_2	D_3	*Supply*	***Row difference***
S_1	(2,4,8,15; 0.6) (1,4,8,18: 0.3)	(3,5,7,12; 0.5) (1,5,7,15; 0.3)	(2,5,9,16; 0.7) (1,5,9,18; 0.3)	25	0.22
S_2	(2,5,8,10; 0.6) (1,5,8,12; 0.2)	(4,8,10,13; 0.4) (3,8,10,15; 0.3)	(3,6,10,15; 0.8) (2,6,10,18; 0.2)	30	0.36
S_3	(2,7,11,15; 0.5) (1,7,11,18; 0.3)	(5,9,12,16; 0.7) (3,9,12,19; 0.2)	(4,6,8,10; 0.6) (3,6,8,12; 0.3)	40	0.76
Demand	35	45	15	95	1.34
Column difference	0.50	0.81	0.28	1.59	

The problem given in Table 3, transformed in Table 4 by using the Stage 2 and assign first allocation usingstage 4 of proposed method.

Table 4 First allocation Table

	D_1	D_2	D_3	Supply	**Row difference**
S_1	(2,4,8,15;0.6) (1,4,8,18; 0.3)	(3,5,7,12;0.5) (1,5,7,15; 0.3) **25**	(2,5,9,16; 0.7) (1,5,9,18; 0.3)	~~25~~ **0**	0.22
S_2	(2,5,8,10;0.6) (1,5,8,12; 0.2)	(4,8,10,13; 0.4) (3,8,10,15; 0.3)	(3,6,10,15; 0.8) (2,6,10,18; 0.2)	30	0.36
S_3	(2,7,11,15; 0.5) (1,7,11,18; 0.3)	(5,9,12,16; 0.7) (3,9,12,19; 0.2)	(4,6,8,10; 0.6) (3,6,8,12; 0.3)	40	0.76
Demand	35	~~45~~ **20**	15	95	1.34
Column difference	0.50	**0.81**	0.28	**1.59**	

Using stage 4 of proposed method remove from Table 4. New reduced shown in Table 5 again apply theprocedure

Table 5 New Reduced Table

	D_1	D_2	D_3	Supply	**Row difference**
S_2	(2,5,8,10;0.6) (1,5,8,12; 0.2)	(4,8,10,13; 0.4) (3,8,10,15; 0.3)	(3,6,10,15; 0.8) (2,6,10,18; 0.2)	30	0.36
S_3	(2,7,11,15; 0.5) (1,7,11,18; 0.3)	(5,9,12,16; 0.7) (3,9,12,19; 0.2)	(4,6,8,10; 0.6) (3,6,8,12; 0.3)	40	0.76
Demand	35	20	15	95	1.12
Column difference	0.50	0.28	0.28	1.06	

	D1	D2	D3	Supply	**Row difference**
S_2	(2,5,8,10;0.6) (1,5,8,12; 0.2)	(4,8,10,13; 0.4) (3,8,10,15; 0.3)	(3,6,10,15; 0.8) (2,6,10,18; 0.2)	30	0.36
S_3	(2,7,11,15; 0.5) (1,7,11,18; 0.3)	(5,9,12,16; 0.7) (3,9,12,19; 0.2)	(4,6,8,10;0.6) (3,6,8,12; 0.3) **15**	~~40~~ **25**	**0.76**
Demand	35	20	~~15~~ **0**	95	**1.12**
Column difference	0.50	0.28	0.28	1.06	

Table 6 Second Allocation Table

Again applying the Stage 5 of the proposed method, all the allocations are made as shown in Table 7.

Table 7 Final allocation table

	D_1	D_2	D_3
S_1	(2,4,8,15; 0.6)(1,4,8,18: 0.3)	(3,5,7,12;0.5)(1,5,7,15; 0.3) **25**	(2,5,9,16; 0.7)(1,5,9,18; 0.3)
S_2	(2,5,8,10;0.6)(1,5,8,12; 0.2) **30**	(4,8,10,13; 0.4)(3,8,10,15; 0.3)	(3,6,10,15; 0.8)(2,6,10,18; 0.2)
S_3	(2,7,11,15;0.5)(1,7,11,18; 0.3) **5**	(5,9,12,16;0.7)(3,9,12,19; 0.2) **20**	(4,6,8,10;0.6)(3,6,8,12; 0.3) **15**

Stage 6: Optimum solution and IF optimum value

Optimal solution, attained in Stage 4, is $x_{12} = 25, x_{21} = 30, x_{31} = 5, x_{32} = 20$ and $x_{33} = 15$ .Generalized trapezoidal Intuitionistic fuzzy optimum value of trapezoidal Intuitionistic fuzzy transportation problem, given in Table 2, is

$$25 \otimes (3,5,7,12;0.5)(1,5,7,15;0.3) + 30 \otimes (2,5,8,10;0.6)(1,5,8,12;0.2) + 5 \otimes (2,7,11,15;0.5)(1,7,11,18;0.3)$$
$$+20 \otimes (5,9,12,16;0.7)(3,9,12,19;0.2) + 15 \otimes (4,6,8,10;0.6)(3,6,8,12;0.3)$$
$$= (305,580,830,1145;0.5)(165,580,830,1385;0.3) \approx 139.0278.$$

Conclusion

Finally we initiate an optimum solution for generalized trapezoidal intuitionistic fuzzy transportation problem whose costs are taken as GTrIFN"s. In initiated method we solved by using ranking function found by PardhaSaradhi et al. [5]. Using this method we can attain directly optimum solution without finding IBFS, which is simplest method and we can solve real life transportation proble**ms.**

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