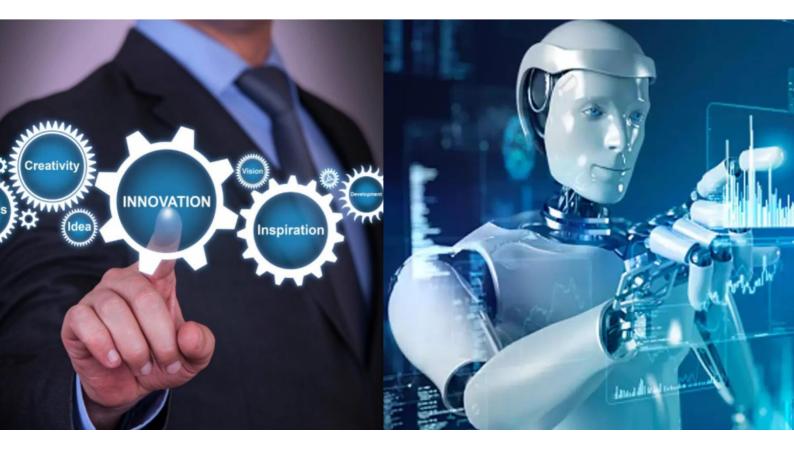




(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.699

Volume 14, Issue 4, April 2025

⊕ www.ijirset.com ⊠ ijirset@gmail.com 🖄 +91-9940572462 🕓 +91 63819 07438





www.ijirset.com |A Monthly, Peer Reviewed & Refereed Journal| e-ISSN: 2319-8753| p-ISSN: 2347-6710|

Volume 14, Issue 4, April 2025

|DOI: 10.15680/IJIRSET.2025.1404333|

Design an Efficient Braun Multiplier Using KSA Based Pass Transistor Logic Using 22nm

J. S. Deepika,

Assistant Professor, Department of ECE, Sri Vasavi Institute of Engineering & Technology (Autonomous),

Nandamuru, Pedana, A.P, India

M. Dharma Teja, K. Sai Sri, B. Kesava Sai Nath, Ch. Pavani

Department of ECE, Sri Vasavi Institute of Engineering & Technology (Autonomous), Nandamuru, Pedana,

A.P, India

ABSTRACT: The Braun multiplier is a well-established and widely recognized array multiplier architecture that has gained popularity due to its inherent simplicity, structural regularity, and efficient mechanism for partial product generation. These characteristics make it a highly favourable choice in the design of digital circuits, particularly in applications where predictable and uniform hardware structures are essential. Traditionally, Braun multipliers have been effectively utilized in various arithmetic operations within digital systems; however, with the continuous evolution of modern computing systems, there has been an increasing demand for designs that offer not only high computational speed but also reduced power consumption and enhanced overall performance.

In response to these emerging requirements, the integration of a Kogge-Stone Adder (KSA) into the Braun multiplier architecture, along with the implementation of advanced Pass Transistor logic technology at the 22nm scale, represents a significant and innovative advancement over conventional multiplier designs. The inclusion of the KSA improves the speed of the final addition stage, which is critical in large-bit-width multipliers, due to the parallel prefix structure of the KSA that minimizes the carry propagation delay. Furthermore, leveraging 22nm CMOS technology allows for more compact, power-efficient, and faster circuits, which are highly desirable in the design of high-performance digital systems.

KEYWORDS: Pass Transistor Logic, Braun multiplier, Kogge Stone Adder, Area consumption, , Parallel Prefix Adder ,22nmTechnology,Tanner EDA.

I. INTRODUCTION

The Braun multiplier is a well-established and widely recognized array multiplier architecture that has gained popularity due to its inherent simplicity, structural regularity, and efficient mechanism for partial product generation. These characteristics make it a highly favourable choice in the design of digital circuits, particularly in applications where predictable and uniform hardware structures are essential. Traditionally, Braun multipliers have been effectively utilized in various arithmetic operations within digital systems; however, with the continuous evolution of modern computing systems, there has been an increasing demand for designs that offer not only high computational speed but also reduced power consumption and enhanced overall performance. In response to these emerging requirements, the integration of a Kogge-Stone Adder (KSA) into the Braun multiplier architecture, along with the implementation of advanced Pass Transistor logic technology at the 22nm scale, represents a significant and innovative advancement over conventional multiplier designs. The inclusion of the KSA improves the speed of the final addition stage, which is critical in large-bit-width multipliers, due to the parallel prefix structure of the KSA that minimizes the carry propagation delay. Furthermore, leveraging 22nm CMOS technology allows for more compact, power-efficient, and faster circuits, which are highly desirable in the design of high-performance digital systems.Keywords – Pass Transistor Logic, Braun multiplier, Kogge Stone Adder, Area consumption, , Parallel Prefix Adder ,22nmTechnology,Tanner EDA.





www.ijirset.com |A Monthly, Peer Reviewed & Refereed Journal| e-ISSN: 2319-8753| p-ISSN: 2347-6710|

Volume 14, Issue 4, April 2025

|DOI: 10.15680/IJIRSET.2025.1404333|

II. PROPOSEDSYSTEM

The new Braun Multiplier using Kogge Stone Adder design now uses 22nm technology transistors.

In 22nm technology, the transistors have a much smaller channel length, significantly reducing area consumption and improving efficiency.

The system now uses fewer transistors—down from the original 276—resulting in less circuit complexity, lower power consumption, and faster operation.

Building a Better Braun Multiplier: After testing the adders, researchers used them in a 4-bit Braun Array Multiplier (BAM).

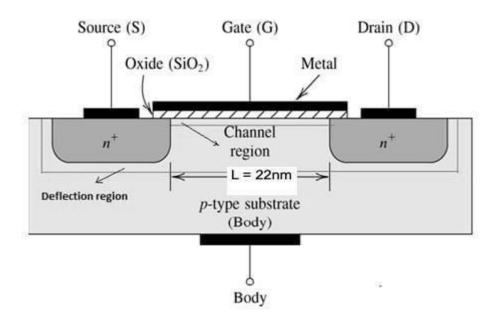
The version of PTL, was used to build a BAM, and the performance was compared.

The results? All designs worked well, but one stood out.

Results for the PTL KSA (in 22nm): Power usage: lower than in the 120nm version due to better transistor performance

Area: more compact layout compared to 120nm design

Delay: overall delay will be reduced to



With growing demand for faster and smaller electronics, efficient circuit design is more important than ever.

This study proves that by rethinking how we build multipliers, we can save space, reduce power, and increase speed all without sacrificing performance.

Now, using 22nm technology, we take a big step forward in chip design. Smaller, faster, and more energy-efficient circuits are no longer the future they're the present





www.ijirset.com |A Monthly, Peer Reviewed & Refereed Journal| e-ISSN: 2319-8753| p-ISSN: 2347-6710|

Volume 14, Issue 4, April 2025

|DOI: 10.15680/IJIRSET.2025.1404333|

III. EXPERIMENTAL RESULTS

	dit View Chart Options											- 8
ê 🛃 i	- 6 - 1 1 1 1 1 1 1 1 1 1	ŝ 🔒 🕵 🖙 🖢 🖿	· 클럽 데 사주 ·	11 🕨 📓 🥏								
	10		14			mul					in the second	
	_					mul						
	1.0										<u>v(03)</u>	
	0.0	10	20	30	40	50	60	70	80	90	100	
					2043	Time (ns)	3570	2.52		0.038	013203	
	1.0										<u>100</u>	
	0.0											
						50 Time (ns)						
	-					mul	-	;	-	_		
	0.0-= <u></u> 0	10	20	30	40	50	60	70	80	90	100	
						Time (ns) mui						
	10											
	Ē	10	20	30	40	50	60	70	80	90	100	
·	u .	IV	20	90	**	Time (ns)	u.	70	80		100	
		-	13			mul	_				v(a3)	
	10											
	00- 	10	20	30	40	50 Time (ns)	60	70	80	90	100	
	_					mul	~	10				
	1.0											
	0.0 -=	10	20	30	40	60	60	70	80	90	100	
						Time (ns)		1998	0.000	1970		
	1.0											
8	-					mul						
	700											
	-100 - 0	10	20	30	40	50	60	70	60	90	100	
lp, pre	wer F1					Time (ns)						NUM
94°											🚳 ^{ENG} 🛞 🗇 🖆	16:2

Fig 1: Input Waveforms

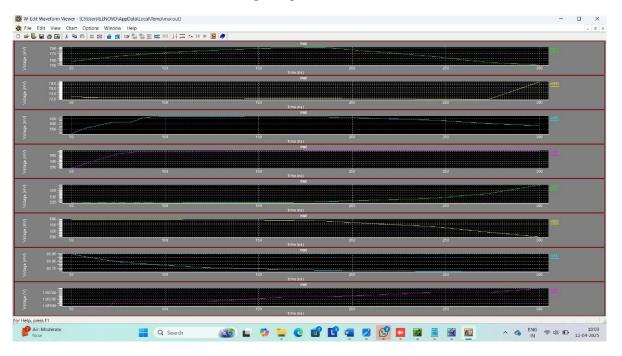


Fig 2:Output Waveforms





www.ijirset.com |A Monthly, Peer Reviewed & Refereed Journal| e-ISSN: 2319-8753| p-ISSN: 2347-6710|

Volume 14, Issue 4, April 2025

|DOI: 10.15680/IJIRSET.2025.1404333|

Input file: mul.sp Progress: Simulation complet	ted	Output: imul.out	
Total nodes: 1162	Active devices:	256 Independent so	urces: 9
Total devices: 265	Passive devices:		
	ors - 0		1 inductors - 0
Transmission lin Voltage source		Coupled transmi	ent sources - 0
	CVS - 0	Curr	VCCS - 0
	CVS = 0		CCCS - 0
V-control swit		I-con	trol switch - 0
Macro devia		External C mode	
HDL devic			
Subcircu			t instances - 44
Independent not	des - 1152	Bou	ndary nodes - 10
Total not	des - 1162		
Measurement resul	1		
TRAN Measure I		7.3270e-009	
Parsing		0.01 seconds	
Setup		0.06 seconds	
DC operating poin	nt	0.08 seconds	
Transient Analys:	is	0.36 seconds	
Overhead		0.80 seconds	
Total		1.31 seconds	
Simulation comple	eted		

Fig 3: Delay Output

i c)			- 0
c)			
ABB = 4			
ea - 0			
28 = 0 ch = 0			
nn - 10			
TRANSFER 0 NOISE 0			
V(03) EVA V(04) EVA V(05) EVA	V(06) EVA V(07) EVA		
5213e-001 1.8223e-001 3.8037e-001 3.	6884e-001 3.3361e-001		
28×200000	THANGTER O NOIDE O	74 = 0 74 = 0 75 = 10 75	74 - 0 74 - 0 75 - 0

Fig 4: Transistor count output

3.050981e-007 2.6783e-005 9.528 3.054620e-007 2.6879e-005 9.530 3.060834e-007 2.6783e-005 9.528	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	4.5730-001 4.61930-001 4.61928-001 4.7228-001 4.7258-001 4.7510-001 4.7729-001 4.7301-001 4.7301-001 4.7304-001 3.7300-001 3.7300-001 3.33510-001 3.8152-001	$\begin{array}{c} 4,7342e-001\\ 4,8608e-001\\ 4,8608e-001\\ 4,8608e-001\\ 4,8809e-001\\ 4,8899e-001\\ 3,6724e-001\\ 3,5724e-001\\ 3,5850e-001\\ 3,5850e-001\\ 3,5958e-001\\ 3,5958e-001\\ 3,6364e-001\\ 3,6383e-001\\ 3,6894e-001\\ 3,6894e-001$	3.3348=-001 3.33648=-001 3.33548=-001 3.33558=-001 3.33678=-001 3.33678=-001 3.33678=-001 3.33678=-001 3.33678=-001		-
1.00091-007 2.6783-005 9.520 0.66024-007 2.6783-005 9.530 0.66024-007 2.6783-005 9.530 0.66024-007 2.6783-005 9.530 0.77138-005 9.530 0.77138-005 9.530 0.77260-007 2.6783-005 9.530 0.77491-007 2.6787-005 9.530 0.784921-007 2.6787-005 9.530 0.784921-007 2.6787-005 9.530 0.784921-007 2.6782-005 9.530 0.551938-007 2.6782-005 9.530 0.551938-007 2.6783-005 9.530 0.551938-007 2.6783-005 9.530 0.52215-007 2.6783-005 9.530 0.52215-007 2.6783-005 9.530 0.52215-007 2.6783-005 9.530 0.5000-007 2.6783-005 9.530 0.5000-007 2.6783-005 9.530 0.5000-007 2.6783-005 9.530 0.5000-007 2.6783-005 9.530 0.5000-007 2.6783-005 9.530 0.55198-007 2.6783-005 9.530 0.5500-007 0.5500-007 9.5500 0.5500-007 0.5500-00	$\begin{array}{c} 274-0.02 & 1.7934-0.01 & 5.1418-0.\\ 8.794-0.02 & 1.7934-0.01 & 5.2434-0.\\ 9.60-0.02 & 1.8759-0.01 & 5.0234-0.\\ 9.60-0.02 & 1.8727-0.01 & 3.5047-0.\\ 9.60-0.02 & 1.8727-0.01 & 3.5512-0.\\ 9.60-0.02 & 1.9772-0.01 & 3.5512-0.\\ 9.60-0.02 & 1.9779-0.01 & 3.5046-0.\\ 9.60-0.02 & 1.9779-0.01 & 3.5046-0.\\ 9.60-0.02 & 1.9779-0.01 & 3.5046-0.\\ 9.60-0.02 & 1.9797-0.01 & 3.5046-0.\\ 9.60-0.02 & 1.9797-0.01 & 3.5324-0.\\ 9.60-0.02 & 1.9794-0.01 & 3.5248-0.\\ 9.60-0.02 & 1.9794-0.01 & 3.5248-0.\\ 9.60-0.02 & 1.9794-0.01 & 3.5248-0.\\ 9.60-0.02 & 1.9648-0.01 & 3.5248-0.\\ 9.60-0.02 & 1.9648-0.01 & 3.5248-0.\\ 9.60-0.02 & 1.9648-0.01 & 3.5248-0.\\ 9.60-0.02 & 1.9698-0.01 & 3.5148-0.\\ 9.60-0.02 & 1.9698-0.01 & 3.5148-0.\\ 9.60-0.02 & 1.9698-0.01 & 3.5178-0.\\ 9.60-0.02 & 1.9968-0.01 & 3.5178-0.\\ 9.60$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{c} 4.52.32 \pm -001\\ 4.541 \pm -001\\ 4.541 \pm -001\\ 4.541 \pm -001\\ 4.561 \pm \pm -001\\ 4.561 \pm \pm -001\\ 4.512 \pm \pm -001\\ 4.723 \pm -001\\ 4.723 \pm -001\\ 4.7511 \pm -001\\ 4.7725 \pm -001\\ 4.7730 \pm -001\\ 4.7301 \pm -001\\ 4.6500 \pm -001\\ 3.7300 \pm -001\\ 3.7300 \pm -001\\ 3.7300 \pm -001\\ 3.8152 \pm -001\\ 8.8152 \pm -001 \end{array}$	$\begin{array}{c} 4,7342e-001\\ 4,8608e-001\\ 4,8608e-001\\ 4,8608e-001\\ 4,8809e-001\\ 4,8899e-001\\ 3,6724e-001\\ 3,5724e-001\\ 3,5850e-001\\ 3,5850e-001\\ 3,5958e-001\\ 3,5958e-001\\ 3,6364e-001\\ 3,6383e-001\\ 3,6894e-001\\ 3,6894e-001$	3.356e-001 3.2928-001 3.385e-001 3.3385e-001 3.3395e-001 3.342e-001 3.342e-001 3.3437e-001 3.3375e-001 3.3378e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001		
0.054200-007 2.0750-005 9.50 0.0034-007 2.0750-005 9.50 0.72350-007 2.0750-005 9.520 0.72350-007 2.07530-005 9.530 0.7230-007 2.07530-005 9.530 0.73200-007 2.07530-005 9.530 0.204100-007 2.07530-005 9.530 0.204100-007 2.07530-005 9.530 0.204100-007 2.0750-005 9.530 0.204100-007 2.0750-005 9.530 0.204100-007 2.0750-005 9.530 0.305100-007 2.0750-005 9.530 0.302000-007 2.0750-005 9.530 0.531330-007 2.0750-005 9.530 0.522150-007 2.0750-005 9.530 0.000000-007 2.0750-005 9.530 0.000000-007 2.0750-005 9.530	$\begin{array}{c} 1.3140 {=} {-}001 & 5.235 {=}001 \\ 0.24002 & 1,755 {=}001 & 5.235 {=}001 \\ 0.46002 & 1,752 {=}001 & 3.755 {=}001 \\ 0.46002 & 1,757 {=}001 & 3.555 {=}001 \\ 0.46002 & 1,757 {=}001 & 3.555 {=}001 \\ 0.46002 & 1,757 {=}001 & 3.554 {=}001 \\ 0.45002 & 1,215 {=}001 & 3.534 {=}001 \\ 0.45002 & 1,215 {=}001 & 3.534 {=}001 \\ 0.45002 & 1,215 {=}001 & 3.534 {=}001 \\ 0.45002 & 1,215 {=}001 & 3.534 {=}001 \\ 0.45002 & 1,215 {=}001 & 3.534 {=}001 \\ 0.45002 & 1,215 {=}001 & 3.534 {=}001 \\ 0.45002 & 1,215 {=}001 & 3.534 {=}001 \\ 0.45002 & 1,215 {=}001 & 3.534 {=}001 \\ 0.45002 & 1,2954 {=}0101 \\ 0.45002 & 1,2954 {=}00$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{c} 4.52.32 \pm -001\\ 4.541 \pm -001\\ 4.541 \pm -001\\ 4.541 \pm -001\\ 4.561 \pm \pm -001\\ 4.561 \pm \pm -001\\ 4.512 \pm \pm -001\\ 4.723 \pm -001\\ 4.723 \pm -001\\ 4.7511 \pm -001\\ 4.7725 \pm -001\\ 4.7730 \pm -001\\ 4.7301 \pm -001\\ 4.6500 \pm -001\\ 3.7300 \pm -001\\ 3.7300 \pm -001\\ 3.7300 \pm -001\\ 3.8152 \pm -001\\ 8.8152 \pm -001 \end{array}$	$\begin{array}{c} 4,7342e-001\\ 4,8608e-001\\ 4,8608e-001\\ 4,8608e-001\\ 4,8809e-001\\ 4,8899e-001\\ 3,6724e-001\\ 3,5724e-001\\ 3,5850e-001\\ 3,5850e-001\\ 3,5958e-001\\ 3,5958e-001\\ 3,6364e-001\\ 3,6383e-001\\ 3,6894e-001\\ 3,6894e-001$	3.356e-001 3.2928-001 3.385e-001 3.3385e-001 3.3395e-001 3.342e-001 3.342e-001 3.3437e-001 3.3375e-001 3.3378e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001 3.336e-001		
.0602346-007 2.6793-005 9.520 0.721358-007 2.6793-005 9.530 0.772040-007 2.6793-005 9.530 0.796020-007 2.6793-000 9.530 0.49691-007 2.6793-005 9.530 0.26918-007 2.6798-005 9.530 0.26918-007 2.6798-005 9.530 0.26926-007 2.6798-005 9.530 0.26926-007 2.6798-005 9.530 0.32656-007 2.6798-005 9.530 0.32656-007 2.6798-005 9.530 0.32656-007 2.6798-005 9.530 0.326578-007 2.6798-005 9.530 0.326578-007 2.6798-005 9.530 0.326578-007 2.6798-005 9.530 0.326578-007 2.6798-005 9.530 0.326578-007 2.6798-005 9.530 0.32578-007 2.6798-005 9.530 0.351938-007 2.6798-005 9.530 0.551938-007 2.6798-005 9.530 0.551938-007 2.6798-005 9.530 0.55098-007 0.55098-007 9.530 0.55098-007 0.55088-007 9.530 0.55098-007 0.55088-007 9.530 0.55098-007 0.55088-007 9.530 0.55098-007 0.55088-007 9.5508 0.55098-007 0.55088-007 9.5508 0.55098-007 0.55088-007 9.5508 0.55098-007 0.55088-007 9.5508 0.55098-007 0.55088-007 9.5508 0.55098-007 0.55088-007 9.5508 0.55098-	44=-021 1.7958=-001 5.0221=-0 66=-021 1.8127=-013 3.5256=-0 66=0201 1.9172=-013 3.5256=-0 85=0-021 1.9175=-013 3.5010=-0 85=0-021 1.9175=-013 3.5010=-0 85=0-021 1.9175=-013 3.5010=-0 05=0-021 1.9175=-013 3.5010=-0 05=0-021 1.9170=-013 3.5370=-0 05=0-021 1.9170=-003 3.5240=-0 06=0-021 1.9594=-003 3.5240=-0 05=0-021 1.60540=-013 3.5170=-0 05=0-021 1.60540=-013 3.5170=-0 05=0-021 1.9596=-003 3.5170=-0 05=0-021 1.9596=-003 3.5170=-0 05=0-021 1.9596=-003 3.5170=-0	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	4.5441c-001 4.5730c-001 4.5730c-001 4.6193c-001 4.7256-001 4.7511c-001 4.7725e-001 4.7725e-001 4.7730t-001 4.7730t-001 4.7730t-001 3.7300e-001 3.7306e-001 3.7330te-001 3.7330te-001 3.8352te-001	$\begin{array}{c} 4.6149-0.01\\ 4.8608-001\\ 4.8608-001\\ 4.9279-001\\ 4.9279-01\\ 3.5850-001\\ 3.5850-001\\ 3.5858-001\\ 3.5858-001\\ 3.5858-001\\ 3.58158-001\\ 3.5858-001\\ 3.6858-001\\ 3.6858-001\\ 3.6858-001\\ 3.6858-001\\ 3.6894-001\\ 3.6896-001\\ 3.6886-001$	3,3262-001 3,3395-001 3,3395-001 3,3395-001 3,3378-001 3,3378-001 3,3378-001 3,3378-001 3,3378-001 3,3378-001 3,3378-001 3,3378-001 3,3358-001 3,3358-001 3,3358-001 3,3358-001 3,3358-001		
L0721358-007 2.6379e-005 9.530 L07260-007 2.6379e-005 9.520 L07460-007 2.6379e-005 9.520 L07460-007 2.6379e-005 9.520 L07460-007 2.6379e-005 9.530 L076109-007 2.6379e-005 9.530 L07	$\begin{array}{c} 0.6 \\ 0.6 \\ 0.6 \\ 0.6 \\ 0.6 \\ 0.7 \\ 0.8 \\$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	4.5730e-001 4.6193e-001 4.61928-001 4.7296e-001 4.7251e-001 4.7725e-001 4.7725e-001 4.7725e-001 4.7301e-001 4.0237e-001 3.7306e-001 3.7306e-001 3.351e-001 3.8152e-001	4.8608-001 4.8079-001 4.8959-001 4.8959-001 3.67240-001 3.59550-001 3.59550-001 3.5959-001 3.5959-001 3.61560-001 3.66360-001 3.66360-001 3.66390-001 3.68590-001	2,3285a-001 3,3355a-001 3,3452a-001 3,3345a-001 3,3375a-001 3,3375a-001 3,3356a-001 3,3356a-001 3,3356a-001 3,3356a-001 3,3356a-001 3,3357a-001 3,3357a-001 3,3357a-001 3,3357a-001		
0.0712/020=007 2.6733=-005 9.520 0.949911=-007 2.6733=-005 9.530 1.226018=-007 2.6733=-005 9.530 1.226018=-007 2.6738=-005 9.530 1.326018=-007 2.6738=-005 9.530 1.356198=-007 2.6738=-005 9.530 1.356198=-007 2.6738=-005 9.530 1.356198=-007 2.6738=-005 9.530 1.356198=-007 2.6738=-005 9.530 1.356198=-007 2.6738=-005 9.530 1.355198=-007 2.6738=-005 9.530 1.4327618=-007 2.6738=-005 9.530 1.4327618=-007 2.6738=-005 9.530 1.4327618=-007 2.6738=-005 9.530 1.4327618=-007 2.6738=-005 9.530 1.551398=-007 2.5738=-005 9.530 1.551398=-007 0.5738=-005 9.530 1.551398=-007 0.5738=-007 9.530 1.551398=-007 0.5738=-007 9.530 1.551398=-007 0.5738=-007 9.530 1.551398=-007 0.5788=-007 9.	de=-002 1.7972e-001 3.5256e-0 05=-002 1.5172e-003 3.5511e-0 83=-002 1.5154e-01 3.534e-0 05=-002 1.5154e-01 3.534e-0 05=-002 1.5174e-02 3.534e-0 05=-002 1.5174e-01 3.534e-0 06=-002 1.7974e-013 3.522e-0 06=-002 1.7974e-013 3.522e-0 06=-002 1.7974e-013 3.522e-0 06=-002 1.7974e-013 3.522e-0 05=-002 1.6054e-013 3.512e-0 05=-002 1.6054e-013 3.512e-0 05=-002 1.6054e-013 3.512e-0 05=-002 1.6054e-013 3.5174e-0 05=-002 1.574e-0 3.5174e-0 05=-002 1.574e-0 3.5174e-0	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	4.5658-001 4.6193e-001 4.7258-001 4.7296e-001 4.7258-001 4.7258-001 4.7258-001 4.7258-001 4.7278-001 4.7306-001 3.2376-001 3.73068-001 3.7308-001 3.83528-001	4.8807e-001 4.8898e-001 4.8898e-001 4.0779e-001 3.6724e-001 3.5850e-001 3.5958e-001 3.5959e-001 3.6156e-001 3.6364e-001 3.6858e-001 3.6894e-001 3.6899e-001	3.3395e-001 3.3372e-001 3.3372e-001 3.3345e-001 3.3345e-001 3.3348e-001 3.3366e-001 3.3354e-001 3.3355e-001 3.3355e-001 3.3355e-001 3.3355e-001 3.3357e-001 3.3357e-001		
.0949912-007 2.6379e-005 9.530 1.280618-007 2.6379e-005 9.530 2.06139e-007 2.6379e-005 9.532 2.36139e-007 2.6379e-005 9.532 2.363028-007 2.6379e-005 9.532 2.363028-007 2.6379e-005 9.532 3.303696-007 2.6379e-005 9.533 3.304596-007 2.6379e-005 9.533 3.304596-007 2.6379e-005 9.533 3.304596-007 2.6379e-005 9.533 3.304596-007 2.6379e-005 9.533 3.304396-007 2.6379e-005 9.533 3.3024159-007 2.6379e-005 9.533 3.3024196-007 2.6379e-005 9.533 3.30240000000000000000000000000000000000	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{c} 001 & 4, 8566e-001\\ 011 & 4, 8565e-001\\ 001 & 4, 8955e-001\\ 011 & 5, 416e-001\\ 011 & 5, 416e-001\\ 011 & 5, 3463e-001\\ 011 & 5, 0463e-001\\ 011 & 5, 0464e-001\\ 011 & 4, 0244e-001\\ 011 & 4, 0244e-001\\ 011 & 3, 7327e-001\\ 011 & 3, 7327e-001\\ 011 & 1, 8750e-001\\ 011 & 1, 8153e-001\\ 011 & 1, 8153e-001\\ \end{array}$	4 6193e-001 4 6725e-001 4 7296e-001 4 7296e-001 4 7511e-001 4 7725e-001 4 7725e-001 4 7301e-001 4 6690e-001 4 2778e-001 3 7106e-001 3 7380e-001 3 8155e-001	4.9279e-001 4.8895e-001 3.6724e-001 3.5955e-001 3.5955e-001 3.5955e-001 3.5955e-001 3.6156e-001 3.6364e-001 3.6894e-001 3.6895e-001	3,3342e-001 3,3377e-001 3,3345e-001 3,3345e-001 3,3345e-001 3,3365e-001 3,3365e-001 3,3367e-001 3,3356e-001 3,3355e-001 3,3355e-001 3,3355e-001 3,3355e-001		
1.2800.18-007 2.0738-003 9.528 1.2800.18-007 2.0738-003 9.530 2.061386-007 2.0738-036 9.530 2.061386-007 2.0738-036 9.530 2.061386-007 2.0738-005 9.530 2.067476-007 2.0738-005 9.530 2.067476-007 2.0738-005 9.532 2.051398-007 2.0738-005 9.532 2.051398-007 2.0738-005 9.532 2.051398-007 2.0738-005 9.530 2.051398-007 2.0738-005 9.530 2.051398-007 2.0738-005 9.530 0.0000006-007 2.0738-005 9.530 0.000006-007 2.0738-005 9.530 0.000006-007 2.0738-005 9.530 0.000006-007 2.0738-005 9.530 0.000006-007 2.0738-005 9.530 0.000006-007 2.0738-005 9.530 0.000006-007 2.0738-005 9.530 0.000008-007 2.0738-005 9.530 0.00000000-007 2.0738-005 9.530 0.0000000000000000000000000000000000	$\begin{array}{c} 8 \\ 8 \\ 5 \\ - 0 \\ 5 \\ - 0 \\ 5 \\ - 0 \\ 5 \\ - 0 \\ 5 \\ - 0 \\ 5 \\ - 0 \\ 5 \\ - 0 \\$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	4.6725e-001 4.7511e-001 4.7511e-001 4.7511e-001 4.7725e-001 4.7301e-001 4.7301e-001 4.2778e-001 4.2778e-001 3.237e-001 3.7380e-001 3.8152e-001	4.8899e-001 4.0779e-001 3.6724e-001 3.5959e-001 3.5915e-001 3.5915e-001 3.6156e-001 3.6636e-001 3.6634e-001 3.6694e-001 3.6894e-001 3.6879e-001	3.3377=001 3.3375=001 3.3375=001 3.3375=001 3.3368=001 3.3354=001 3.3355=001 3.3355=001 3.3355=001 3.3355=001 3.3357=001 3.3557=001 3.3577=00000000000000000000000000000000000		
100145-007 2.6379-005 9.530 206380-007 2.6379-005 9.530 2.389180-007 2.6379-005 9.532 2.389180-007 2.63790-005 9.532 2.389240-007 2.63790-005 9.530 2.3893760-007 2.63790-005 9.530 3.301580-007 2.63790-005 9.530 3.301580-007 2.63790-005 9.530 3.301580-007 2.63790-005 9.530 3.302180-007 2.63790-005 9.530 3.302180-007 2.63790-005 9.530 3.202180-007 2.63790-005 9.530 3.202180-007 2.63790-005 9.530 3.202180-007 2.63790-005 9.530 3.202180-007 2.63790-005 9.530 3.551930-007 2.63790-005 9.530	058-002 1.91158-001 3.5374-0 058-002 1.970-003 3.5056-0 058-002 1.91128-001 3.5378-0 066-002 1.93178-003 3.5258-0 046-002 1.9319-003 3.5242-0 046-002 1.9319-003 3.5242-0 038-002 1.9594-003 3.5140-0 038-002 1.9594-003 3.5145-0 078-002 1.9595-003 3.5245-0 078-002 1.9595-003 3.5245-0 078-002 1.9595-003 3.5245-0 078-002 1.9595-003 3.5245-0 078-002 1.9595-003 3.5245-0 078-002 1.9596-003 3.5245-0 078-002 1.9596-003 3.5245-0 078-002 1.9596-003 3.5245-0 078-002 1.9596-003 3.5245-0 05-002 1.9596-0 05-002 1.9596-0 05	001 4.8905e-001 011 5.1416e-001 011 5.3740e-001 011 5.3740e-001 011 5.0998e-001 011 5.0998e-001 011 5.0398e-001 011 3.7327e-001 011 2.3871e-001 011 1.9760e-001 011 1.813æ-001 011 1.823e-001	4.7296e-001 4.7511e-001 4.7725e-001 4.7729e-001 4.7301e-001 4.6590e-001 4.0237e-001 4.0237e-001 3.7180e-001 3.7380e-001 3.8152e-001	4:0779e-001 3:6724e-001 3:5850e-001 3:595e-001 3:5949e-001 3:5949e-001 3:6354e-001 3:6854e-001 3:6894e-001 3:6894e-001	3.3345e-001 3.3375e-001 3.3368e-001 3.3366e-001 3.3356e-001 3.3355e-001 3.3355e-001 3.3357e-001 3.3367e-001 3.3367e-001		
2006100-007 2.6733-0105 9.520 228918-007 2.6738-005 9.530 228008-007 2.6738-005 9.530 228008-007 2.6738-005 9.530 3026474-007 2.6738-005 9.530 332950-007 2.6738-005 9.530 405270-007 2.6738-005 9.530 405270-007 2.6738-005 9.530 2427618-007 2.6738-005 9.530 232018-007 2.6738-005 9.530 353198-007 2.6738-005 9.530 352198-007 2.6738-005 9.530 352198-007 2.6738-005 9.530 352198-007 2.6738-005 9.530	$\begin{array}{llllllllllllllllllllllllllllllllllll$	001 5.1416e-001 001 5.3740e-001 001 5.3463e-001 001 5.3463e-001 001 5.0998e-001 001 4.7779e-001 001 3.7327e-001 001 3.7327e-001 001 1.9760e-001 001 1.8152e-001 001 1.8152e-001 001 1.8232e-001	4.7511e-001 4.7725e-001 4.7725e-001 4.7301e-001 4.6690e-001 4.0237e-001 3.7106e-001 3.7106e-001 3.8151e-001 3.8151e-001	3.6724e-001 3.5850e-001 3.5958-001 3.5915e-001 3.5915e-001 3.6364e-001 3.6364e-001 3.6853e-001 3.6894e-001 3.6879e-001 3.6879e-001	3.3375e-001 3.3348e-001 3.3365e-001 3.3354e-001 3.3357e-001 3.3355e-001 3.3355e-001 3.3355e-001 3.3355e-001 3.3355e-001		
228918e-007 2.6879e-005 9.530 2260740-007 2.6879e-005 9.520 286740-007 2.6979e-005 9.520 286740-007 2.6792e-005 9.520 3300560-007 2.6792e-005 9.530 3300560-007 2.6792e-005 9.530 3300500-007 2.6792e-005 9.530 3402270-007 2.6792e-005 9.530 3514330e-007 2.6792e-005 9.530 3521430e-007 2.6792e-005 9.530 3521430e-007 2.6792e-005 9.530 3521430e-007 2.6792e-005 9.530 3521430e-007 2.6792e-005 9.530 3521430e-007 2.6792e-005 9.530 3521500-007 2.6792e-005 9.530 3521600-007 2.6792e-005 9.530	03=-001 1.812@-001 3.5317@-0 04@-021 7.9787=-001 3.5225=0 04@-022 1.9797=-001 3.5123@-0 04@-021 1.9791=-001 3.51242=0 03@-022 1.9794=-001 3.5124@=0 03@-022 1.7994=-001 3.5244@=0 07@-022 1.7994=-001 3.5244@=0 07@-022 1.7994=-001 3.5244@=0 07@-022 1.9996=-001 3.5246=0 87@-022 1.7996@=001 3.5279=0 87@-022 1.9996@=001 3.5279=0 87@-022 1.9996@=001 3.5279=0 03@=021 0.094@=001 3.5279=0	001 5.3740=001 001 5.3463=001 01 5.0998=001 001 5.0998=001 001 4.7779=001 001 4.7327=001 001 3.7327=001 001 3.7327=001 001 1.9760=001 001 1.8271e=001 001 1.8153e=001 001 1.8238=001	4.7725e-001 4.7729e-001 4.6690e-001 4.6690e-001 4.0237e-001 3.7106e-001 3.7380e-001 3.8151e-001 3.8151e-001	3.5850e-001 3.5895e-001 3.5915e-001 3.6156e-001 3.6364e-001 3.6853e-001 3.6894e-001 3.6894e-001 3.6896e-001	3.3348=-001 3.33648=-001 3.33548=-001 3.33558=-001 3.33678=-001 3.33678=-001 3.33678=-001 3.33678=-001 3.33678=-001		
2.63082a=007 2.6732a=005 9.520 2.66747a=007 2.6752a=005 9.530 2.985747a=007 2.6752a=005 9.530 3.3302660=007 2.6752a=005 9.530 3.3302660=007 2.6752a=005 9.530 4.322761a=007 2.6752a=005 9.530 4.322761a=007 2.6752a=005 9.530 0.530315a=007 2.6752a=005 9.530 0.530315a=007 2.6752a=005 9.530 0.000000e=007 2.6753a=005 9.520 9050IN NON=GRAPHICAL DATA were Results	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	001 5.3463e-001 001 5.0998e-001 001 4.7779e-001 001 4.0244e-001 001 3.7327e-001 001 2.3871e-001 001 1.9760e-001 001 1.8271e-001 001 1.8273e-001 001 1.8273e-001 001 1.8293e-001	4.7729e-001 4.7301e-001 4.6690e-001 4.0237e-001 3.7106e-001 3.7380e-001 3.8151e-001 3.8151e-001	3.5895e-001 3.5915e-001 3.5949e-001 3.6156e-001 3.6364e-001 3.6853e-001 3.6894e-001 3.6894e-001 3.6896e-001	3.3368=001 3.3354=001 3.3357=001 3.3355=001 3.3355=001 3.3355=001 3.3357=001 3.3357=001		
2067470-007 2.67790-005 9.530 208578-007 2.67790-005 9.532 3305580-007 2.67790-005 9.532 3005580-007 2.67790-005 9.530 3514000-007 2.67790-005 9.530 3514000-007 2.67790-005 9.530 35214000-007 2.67790-005 9.530 35214000-007 2.67790-005 9.530 35214000-007 2.67790-005 9.530 35214000-007 2.67790-005 9.530 35216000-007 2.67790-005 9.530 35216000000-007 2.6790-005 9.530	04e-002 1.8102e-001 3.5192e-0 86e-002 1.7991a-001 3.5242e-0 03e-002 1.8098e-001 3.5180e-0 86e-002 1.7994e-001 3.5180e-0 86e-002 1.7994e-001 3.5124e-0 03e-002 1.8098e-001 3.5178e-0 87e-002 1.7995e-001 3.5178e-0 87e-002 1.7996e-001 3.5178e-0 87e-002 1.8094e-001 3.5178e-0	001 5.0998e-001 1.7778e-001 1.2244e-001 1.23871e-001 1.3760e-001 1.92760e-001 1.8153e-001 1.8153e-001 1.8153e-001 1.8293e-001	4.7301e-001 4.6690e-001 4.2778e-001 4.0237e-001 3.7106e-001 3.7380e-001 3.8151e-001 3.8152e-001	3.5915e-001 3.5949e-001 3.6156e-001 3.6364e-001 3.6853e-001 3.6894e-001 3.6896e-001 3.6886e-001	3.3354e-001 3.3367e-001 3.3355e-001 3.3367e-001 3.3355e-001 3.3355e-001 3.3355e-001 3.3355e-001		
2983708-007 2.6732-005 9.520 332650-007 2.6732-005 9.530 330150-007 2.6732-005 9.530 405227-007 2.6732-005 9.530 4327610-07 2.6732-005 9.530 4327610-07 2.6733-000 9.530 2551938-007 2.6733-00 9.530 0000000-007 2.6733-005 9.520 BRGIN NON-GRAPHICAL DATA were Results	86=002 1.7991=-001 3.5242=-0 03e-002 1.8098e-001 3.5180e-0 86=002 1.7994e-001 3.5242e-0 03e-002 1.8096e-001 3.5242e-0 03e-002 1.8096e-001 3.5242e-0 03e-002 1.8096e-001 3.5247e-0 03e-002 1.8095e-001 3.5247e-0 03e-002 1.8095e-001 3.5179e-0 87e-002 1.7996e-001 3.5247e-0 03e-002 1.8094e-001 3.5178e-0	001 4.7779e-001 4.0244e-001 001 001 3.7327e-001 001 2.3871e-001 001 1.9760e-001 001 1.8271e-001 001 1.8153e-001 001 1.8292e-001	4.6690m-001 4.2778e-001 4.0237e-001 3.7106e-001 3.7380e-001 3.8151e-001 3.8152e-001	3.5949e-001 3.6156e-001 3.6364e-001 3.6853e-001 3.6894e-001 3.6899e-001 3.6896e-001	3.3367e-001 3.3355e-001 3.3367e-001 3.3355e-001 3.3355e-001 3.3367e-001 3.3355e-001		
332565-07 2.63756-03 9.530 350356-07 2.63756-03 9.530 405276-07 2.63796-03 9.530 405276-07 2.63796-03 9.530 435036-07 2.6378-03 9.530 353198-07 2.6378-03 9.530 353198-07 2.6378-03 9.530 353198-07 2.6378-03 9.530 000000-07 2.63798-03 9.530 000000-07 2.63798-03 9.530	03e-002 1.8098e-001 3.5180e-0 86e-002 1.7994e-001 3.5244e-0 03e-002 1.8096e-001 3.5175e-0 87e-002 1.7995e-001 3.5175e-0 03e-002 1.8095e-001 3.5179e-0 87e-002 1.7996e-001 3.5179e-0 87e-002 1.7996e-001 3.5178e-0	001 4.0244e-001 001 3.7327e-001 2.3871e-001 001 1.9760e-001 001 1.8271e-001 001 1.8153e-001 001 1.8293e-001	4.2778e-001 4.0237e-001 3.7106e-001 3.7380e-001 3.8151e-001 3.8152e-001	3.6156e-001 3.6364e-001 3.6853e-001 3.6894e-001 3.6879e-001 3.6886e-001	3.3355e-001 3.3367e-001 3.3355e-001 3.3367e-001 3.3355e-001		
.301360-007 2.6792e-005 9.520 405227e-007 2.6792e-005 9.530 4322761e-007 2.6792e-005 9.530 5.5194308-007 2.6793e-008 9.530 2.52192e-007 2.6793e-008 9.530 0.000000e-007 2.6793e-005 9.530 0.000000e-007 2.6793e-005 9.530 9.530 9.530 BEGIN NON-GRAPHICAL DATA were Results	86e-002 1.7994e-001 3.5244e-0 03e-002 1.8096e-001 3.5175e- 037e-002 1.7995e-001 3.5246e-0 03e-002 1.7995e-001 3.5246e-0 87e-002 1.8095e-001 3.5179e-0 03e-002 1.8094e-001 3.5178e-0	001 3.7327e-001 001 2.3871e-001 1.9760e-001 001 1.9271e-001 001 1.8153e-001 001 1.8293e-001	4.0237e-001 3.7106e-001 3.7380e-001 3.8151e-001 3.8152e-001	3.6364e-001 3.6853e-001 3.6894e-001 3.6879e-001 3.6886e-001	3.3367e-001 3.3355e-001 3.3367e-001 3.3355e-001		
4052270-007 2,68790-005 9,530 4207610-007 2,68790-005 9,520 55143300-007 2,68790-005 9,520 5551930-007 2,68790-005 9,520 9,222150-007 2,68790-005 9,520 9,0000000-007 2,68790-005 9,520 5500 NON-GRAPHICAL DATA wer Results	03e-002 1.8096e-001 3.5175e-0 87e-002 1.7995e-001 3.5246e-0 03e-002 1.7995e-001 3.5247e-0 87e-002 1.7996e-001 3.5179e-0 87e-002 1.8094e-001 3.5178e-0	001 2.3871e-001 001 1.9760e-001 001 1.8271e-001 001 1.8153e-001 001 1.8293e-001	3.7106e-001 3.7380e-001 3.8151e-001 3.8152e-001	3.6853e-001 3.6894e-001 3.6879e-001 3.6886e-001	3.3355e-001 3.3367e-001 3.3355e-001		
432761e-007 2.6782e-005 9.528 514303e-005 9.530 555193e-007 2.6782e-005 9.528 9.22615e-007 2.6879e-005 9.528 9.020000e-005 9.538 9.000000e-005 9.538 9.00000e-005 9.528 9.00000e-005 9.528	87e-002 1.7995e-001 3.5246e-0 03e-002 1.8095e-001 3.5179e-0 87e-002 1.7996e-001 3.5247e-0 03e-002 1.8094e-001 3.5178e-0	001 1.9760e-001 001 1.8271e-001 001 1.8153e-001 001 1.8293e-001	3.7380e-001 3.8151e-001 3.8152e-001	3.6894e-001 3.6879e-001 3.6886e-001	3.3367e-001 3.3355e-001		
.514303e-007 2.6879e-005 9.530 .555193e-007 2.6879e-005 9.528 .922815e-007 2.6879e-005 9.530 .000000e-007 2.6703e-005 9.528 .000000e-007 2.6703e-005 9.528 .9EGIN NON-GRAPHICAL DATA	03e-002 1.8095e-001 3.5179e-0 87e-002 1.7996e-001 3.5247e-0 03e-002 1.8094e-001 3.5178e-0	001 1.8271e-001 001 1.8153e-001 001 1.8293e-001	3.8151e-001 3.8152e-001	3.6879e-001 3.6886e-001	3.3355e-001		
5551932-007 2.67832-005 9.528 9228152-007 2.68792-005 9.530 0000000-007 2.67932-005 9.528 DEGIN NON-GRAPHICAL DATA APPR Results	87e-002 1.7996e-001 3.5247e-0 03e-002 1.8094e-001 3.5178e-0	001 1.8153e-001 001 1.8293e-001	3.8152e-001	3.6886e-001			
922815e-007 2.6879e-005 9.530 000000e-007 2.6783e-005 9.528 BEGIN NON-GRAPHICAL DATA	03e-002 1.8094e-001 3.5178e-0	001 1.8293e-001					
000000e-007 2.6783e-005 9.528 BEGIN NON-GRAPHICAL DATA Wer Results							
NEGIN NON-GRAPHICAL DATA	0,0002 11,0000 001 0,02400 0						
rage power consumed -> 2.507337 power 8.758599e-004 at time 0 power 3.526919e-005 at time 8.							
BEGIN NON-GRAPHICAL DATA							
ASUREMENT RESULTS							
ASUREMENT RESULTS							

Fig 5 Power consumption output





www.ijirset.com |A Monthly, Peer Reviewed & Refereed Journal| e-ISSN: 2319-8753| p-ISSN: 2347-6710|

Volume 14, Issue 4, April 2025

|DOI: 10.15680/IJIRSET.2025.1404333|

IV.CONCULSION

This project involved designing a Braun Multiplier using a Kogge-Stone Adder (KSA) combined with pass transistor logic (PTL), targeting 22nm Pass Transistor technology in Tanner EDA. The design aimed to achieve high speed and low power by using the regular and modular structure of the Braun Multiplier, the fast performance of the KSA, and the area-saving benefits of PTL. Simulation results confirmed that the multiplier worked correctly and showed improvements in speed, area, and power usage compared to traditional CMOS designs. Using PTL reduced the number of transistors, which helped decrease unwanted capacitance and increase switching speed. The KSA, with its efficient carry propagation, further boosted the overall speed. The use of 22nm technology also improved the design by allowing for a smaller, more power-efficient layout. The final design passed all DRC (Design Rule Check) and LVS (LayoutVersus Schematic) checks in Tanner EDA, with very low leakage, proving that the approach is suitable for VLSI applications.In summary, combining the KSA and PTL in the Braun Multiplier provides a fast, compact, and low-power solution for modern digital systems.

REFERENCES

- 1. "Design an Efficient Braun Multiplier Using KSA Based CMOS Logics" Authors: Daphni S, Vijula Grace K. S, Judith Johnsi J, Bamini S
- 2. "Design of Low Power 4-Bit CMOS Braun Multiplier Based on Threshold Voltage Techniques" Author: Dayadi Lakshmaiah
- 3. "Design of Braun Multiplier with Kogge Stone Adder & Its Implementation on FPGA" Authors: Ms. Madhu Thakur, Prof. Javed Ashraf
- 4. "Des ign of High-Speed Low Power Computational Blocks for DSP Processors"** Author: Sai Prasad Goud
- 5. **"Efficient Serial Multiplier Design using Ripple Counters, Kogge-Stone Adder and Full Adder" Authors: S. Sangeetha, S. S. R. Kumar
- 6. "Design and Performance Analysis of Multipliers Using Kogge Stone Adder" Authors: Neeraja Bandi, R. Sai Prasad Goud
- 7. "An Optimized 4×4 Braun Multiplier for Parallel Processing Architectures with a 3-bit KSA Adder" Authors: M. Sakthimohan, Elizabeth Rani G, Monisha P, Nandhini S
- 8. "Design and Implementation of Braun Multiplier using Verilog: Review" Authors: Anukrati Sharma, Aparna Mittal, Anshika Singh, Raman Kapoor
- 9. "Design Analysis of Wallace Tree Based Multiplier Using Approximate Full Adder and Kogge Stone Adder" Authors: Navin Kumar M, Adithyaa R S, Bhavan Kumar D, Pavithra T
- 10. S. S. Sapatnekar, "Timing Analysis and Optimization of Sequential Circuits," Springer Science & Business Media, 2012.
- 11. P. Gupta, A. B. Kahng, P. Sharma, and D. Sylvester, "Selective Gate-Length Biasing for Cost-Effective Runtime Leakage Control," IEEE Transactions on Computer









INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY





www.ijirset.com