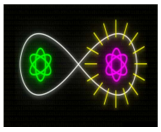
100+ Years of Glorious history inscribed in the yeomen service to the field of education
Centenary Celebrated Sharnbasveshwar Vidya Vardhak Sangha's
ಶರಣಬಸವ ವಿಶ್ವವಿದ್ಯಾಲಯ
Sharnbasva University
Estd. 2017
Kalaburagi - 585103, Karnataka - India
ಕಲಬುರಗಿ ೫೮೫ ೧೦೩ ಕರ್ನಾಟಕ - ಭಾರತ
Phone / Fax No. 08472-277852, 277853, 277854, 277855 www.sharnbasvauniversity.edu.in - email : Sharnbasvauniversity@gmail.com

Online Two Days Workshop
On



"Quantum Computing and Communications : New Paradigm"

On the view of "DigitALL: Innovation & Technology for Gender Equality"

International Women's Day Week 2023 Celebration

28th February 2023 & 1st March 2023

Organizing by

Faculty of Engineering & Technology – Exclusively for Women

Sharnbasva University, Kalaburagi, Karnataka India

In Association with

IEEE Women in Engineering Affinity Group, IEEE Bangalore Section

Sharnbasveshwar Institutions Campus,
Kalaburagi -585102, Karnataka, India

Phone/Fax No. : 08472 – 277852, 277853, 277854
Website : www. sharnbasvauniversity.edu.in

Title of the Event	Online Two Days Workshop On **"Quantum Computing and Communications : New Paradigm"**
Date of Activity held	28th February 2023 & 1st March 2023
Time of Activity	10:00a.m & 2:00p.m
Mode of Activity	Online – GoToMeeting Video Conference Platform
Resource Person	Dr. S. Manjula Gandhi & Dr. S. Gayathri Devi
Professional details of Resource Person	**Dr. S. Manjula Gandhi** Associate Professor Department of Computing Coimbatore Institute of Technology Coimbatore, Tamil Nadu, India **Dr. S. Gayathri Devi** Assistant Professor Department of Computing Coimbatore Institute of Technology Coimbatore, Tamil Nadu, India
Program/Course/ Class	UG & PG Students and Faculty Members of All Programs of our University.
Number of PG Students/Research Scholars and Faculty Members attended	170 Participants.
Convenor	**Dr. Lakshmi Maka,** Dean, Sharnbasva University IEEE WIE Student Branch Mentor and Faculty Advisor
Co-Convenors	**Prof. Shivganga Patil** Chairman, Dept of ECE, FETW, Sharnbasva University.
Activity In charge	**Dr. Asharani Patil** Associate Professor, Dept. of Electronics & communication Engg., And Faculty Members of Electronics & Communication Engg.,Faculty of Engineering & Technology – Exclusively for Women., Sharnbasva University, Kalaburagi, Karnataka, India.

Brief of Workshop	Online Two Days Workshop On **"Quantum Computing and Communications : New Paradigm"** Quantum computing is one of the most significant breakthroughs of the present century. It is a new disruptive paradigm based on the principles of quantum mechanics to solve problems in various fields of science that are beyond the possibilities of classical computing infrastructures. Despite, lot of theoretical research and hardware implementation application of quantum computing in solving computational problem is yet to be explored. In future, a new generation of quantum technologies will drive the development of disruptive devices, services and systems which will primarily impact imaging and computing of intractable problems as well as enhance network security.
Objective of the Workshop:	1. Broaden their definition of quantum computing 2. Get an overview of the quantum communication & networks, quantum information processing etc,. 3. Learn about practical implementations of various algorithms on quantum computer with communication & networking. 4. Develop machine learning models using quantum computer
Expected Outcomes of the Workshop:	1. Introduction to quantum computing and its research scope 2. Quantum Communication and Network 3. Quantum Secured future optical network and with multidimensional optical sensing 4. Quantum Machine Learning 5. Hands on Quantum computing
Who can attend	Staffs Members, Research Scholars, PG students and final year UG students.
Invitation Resource Person	**Dr. S. Manjula Gandhi** Associate Professor Department of Computing Coimbatore Institute of Technology Coimbatore, Tamil Nadu, India

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Estd. 2017 ಸ್ಥಾಪನೆ : 2017

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UGC Status: Letter No. F.8-29/2017(CPP-I/PU), Dated 20 Dec. 2017. Enlisted by the University Grants Commission, New Delhi, in the list of Private Universities in India.
A Private University enacted by Govt. of Karnataka as "Sharnbasva University Act. 2012" Karnataka Act No. 17 of 2013. Notification No. ED 144 URC 2016 dated 29/07/2017

Ref No: SUK/Acad/22-23/171 Date: 20/02/2023

To,
Dr. S. Manjula Gandhi
Associate Professor
Department of Computing
Coimbatore Institute of Technology,
Coimbatore, Tamil Nadu, India

Subject: Invitation as Resource Person for the FDP Program.

Respected Madam,

With the reference to the above cited subject, Department of Electronics & Communication Engg., Faculty of Engineering & Technology – Exclusively for Women, Sharnbasva University, Kalaburagi, Karnataka is organizing **Online Two Days Faculty Development Program on "Quantum Computing and Communications : New Paradigm"** on **28th February 2023** & **1st March 2023** on the view **of "DigitALL : Innovation & Technology for Gender Equality"** International Women's Day Week 2023 Celebration under **IEEE Women in Engineering Affinity Group Chapter, IEEE Bangalore Section** of our University.

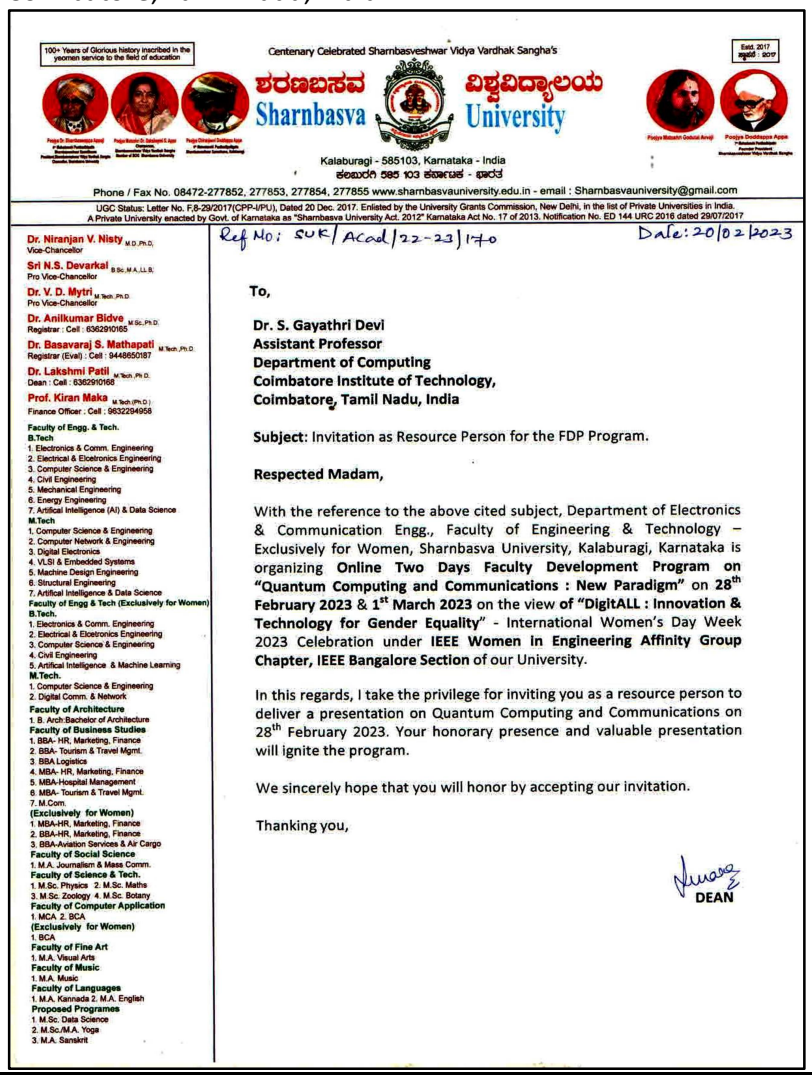
In this regards, I take the privilege for inviting you as a resource person to deliver a presentation on Quantum Computing and Communications on 1st March 2023. Your honorary presence and valuable presentation will ignite the program.

We sincerely hope that you will honor by accepting our invitation.

Thanking you,

DEAN

	Dr. S. Gayathri Devi Assistant Professor Department of Computing Coimbatore Institute of Technology Coimbatore, Tamil Nadu, India
Registration	All the participants were made to free registration. By filling the Google Form on or before 27th February 2023 before 3:00 p.m. **Registration Link** : https://forms.gle/dXpj6k4YtKAVtVwK6
Schedule of the Workshop	**ONLINE MODE – GoToMeeeting Online Conference Platform** **28th February 2023 & 1st March 2023**



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Vice-Chancellor
Sri N.S. Devarkal B.Sc.,M.A.,LL.B.
Pro Vice-Chancellor
Dr. V. D. Mytri M.Tech.,Ph.D.
Pro Vice-Chancellor
Dr. Anilkumar Bidve M.Sc.,Ph.D.
Registrar : Cell : 6362910165
Dr. Basavaraj S. Mathapati M.Tech.,Ph.D.
Registrar (Eval) : Cell : 9448650187
Dr. Lakshmi Patil M.Tech.,Ph.D.
Dean : Cell : 6362910168
Prof. Kiran Maka M.Tech.(Ph.D.)
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3. Computer Science & Engineering
4. Civil Engineering
5. Mechanical Engineering
6. Energy Engineering
7. Artifical Intelligence (AI) & Data Science
M.Tech
1. Computer Science & Engineering
2. Computer Network & Engineering
3. Digital Electronics
4. VLSI & Embedded Systems
5. Machine Design Engineering
6. Structural Engineering
7. Artifical Intelligence & Data Science
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B.Tech.
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2. Electrical & Elcetronics Engineering
3. Computer Science & Engineering
4. Civil Engineering
5. Artifical Intelligence & Machine Learning
M.Tech.
1. Computer Science & Engineering
2. Digital Comm. & Network
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Faculty of Business Studies
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2. BBA- Tourism & Travel Mgmt.
3. BBA Logistics
4. MBA- HR, Marketing, Finance
5. MBA-Hospital Management
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(Exclusively for Women)
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1. M.A. Visual Arts
Faculty of Music
1. M.A. Music
Faculty of Languages
1. M.A. Kannada 2. M.A. English
Proposed Programes
1. M.Sc. Data Science
2. M.Sc./M.A. Yoga
3. M.A. Sanskrit

Ref No: SUK/Acad/22-23/170 Date: 20/02/2023

To,

Dr. S. Gayathri Devi
Assistant Professor
Department of Computing
Coimbatore Institute of Technology,
Coimbatore, Tamil Nadu, India

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In this regards, I take the privilege for inviting you as a resource person to deliver a presentation on Quantum Computing and Communications on 28th February 2023. Your honorary presence and valuable presentation will ignite the program.

We sincerely hope that you will honor by accepting our invitation.

Thanking you,

DEAN

Schedule of Workshop

Day 1 : Tuesday : 28th February 2023		
Timing	**Topics to be covered**	
10:00a.m - 10:30 a.m	Inaugural of workshop	
10:30a.m - 12:30p.m	**Session – I : Dr. S.Gayathri Devi**	
	Topics covered :	Introduction to Quantum computing
		Single qubit quantum gates
		Working demo using IBM Qiskit
12:30p.m - 2:00p.m	**Lunch Break**	
2:00p.m - 4:00p.m	**Session – II : Dr. S.Gayathri Devi**	
	Topics covered :	Multi qubit quantum gates
		IBM Qiskit simulators
		Working demo using IBM Qiskit
4:00p.m	**Discussion with Feedback - I**	
Day 2 : Wednesday : 1st March 2023		
10:00a.m - 12:00 p.m	**Session – III : Dr. S.Manjula Gandhi**	
	Topics Covered	Working with Quantum Circuits
		Quantum Entanglement
		Working demo using IBM Qiskit
12:30p.m - 2:00p.m	**Lunch Break**	
2:00p.m - 4:00p.m	**Session – IV : Dr. S.Manjula Gandhi**	
	Topics Covered	Quantum Teleportation
		Working demo using IBM Qiskit
4:00p.m – 4:30p.m	**Discussion with Valedictory function**	
	Feedback - II	

Inaugural	Inaugural session was head by Registrar Sir and Dean of our Sharnbasva University **AGENDA** **1.** Welcome Speech **2.** Lightning of Lamp by the Dignitaries Digitally **3.** Brief on Workshop. **4.** Introduction of Resource Person – 1 **5.** Introduction of Resource Person – 1 **6.** Formal Welcome to both Resource Person **7.** Warm talk by our Dean Madam **8.** Then start with Session.

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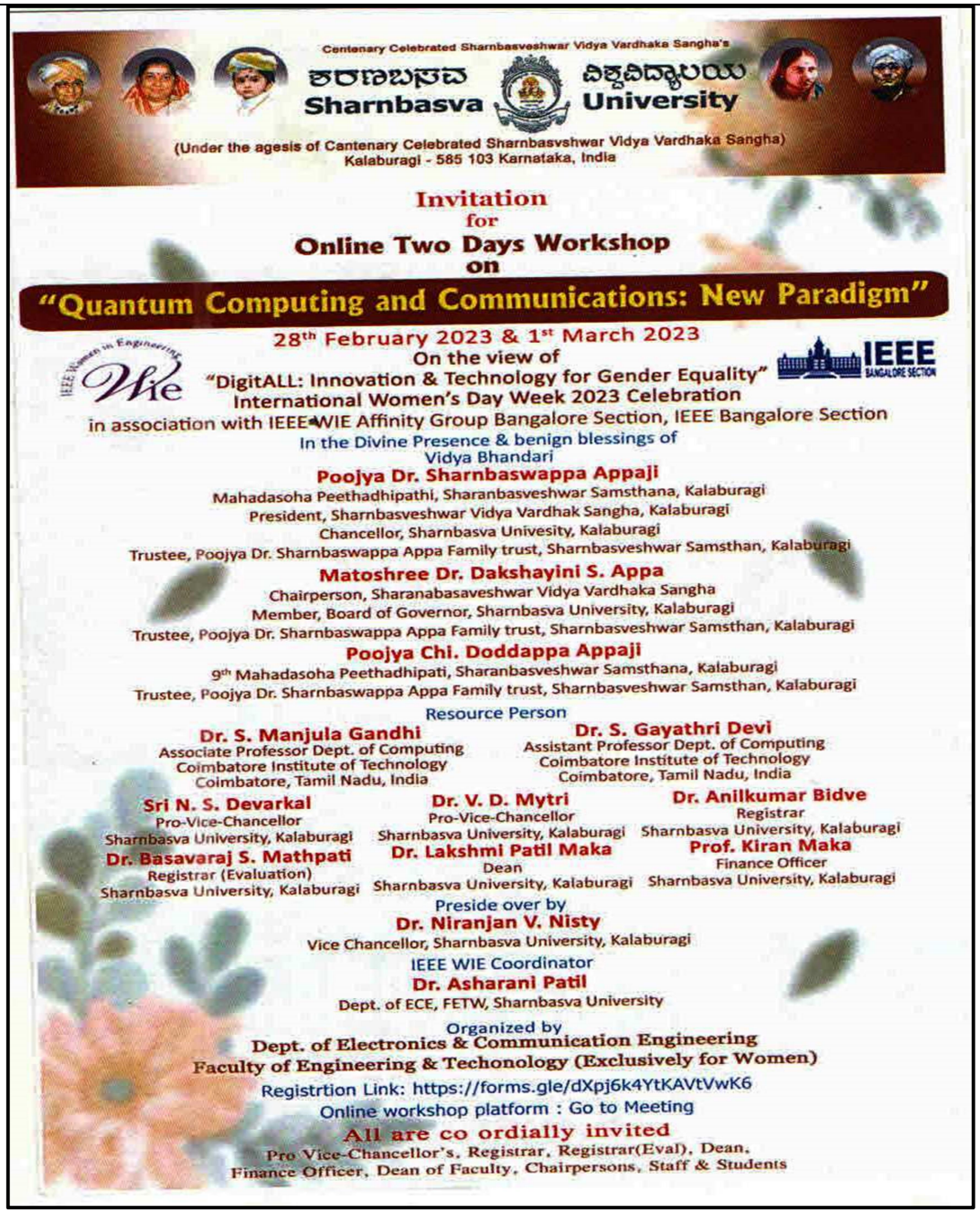
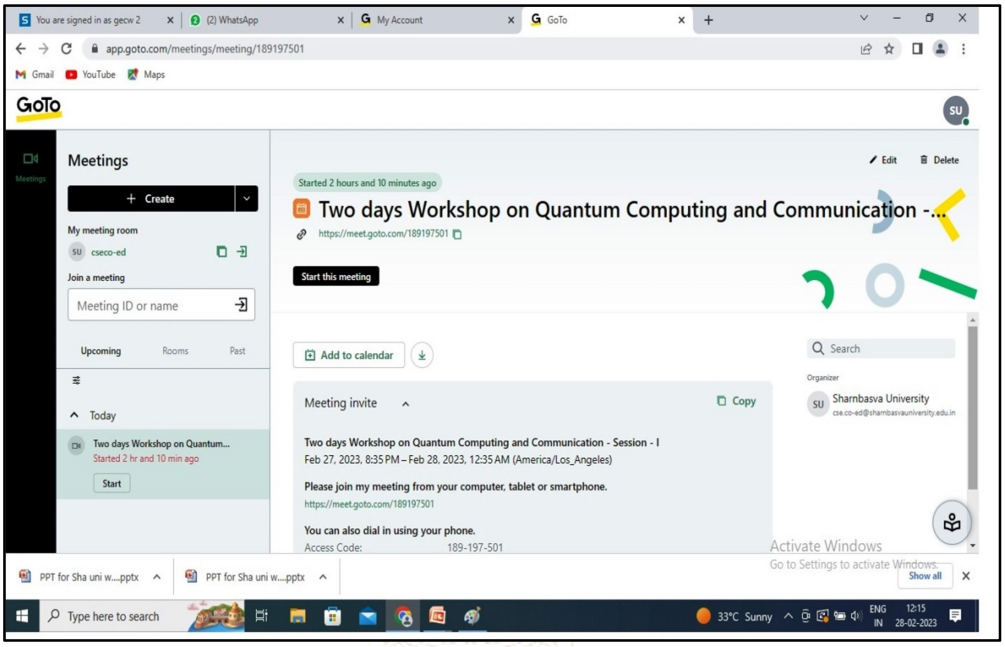
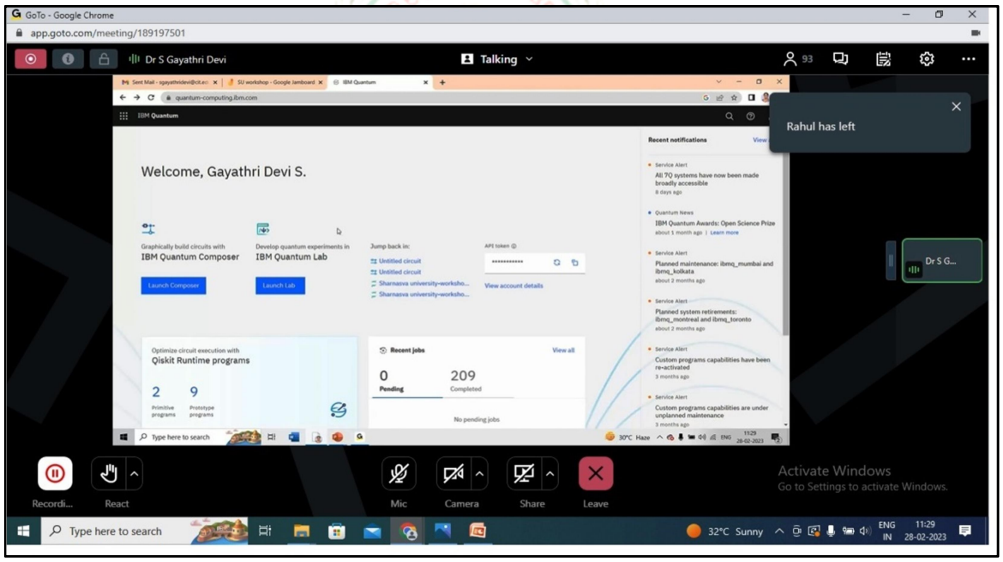


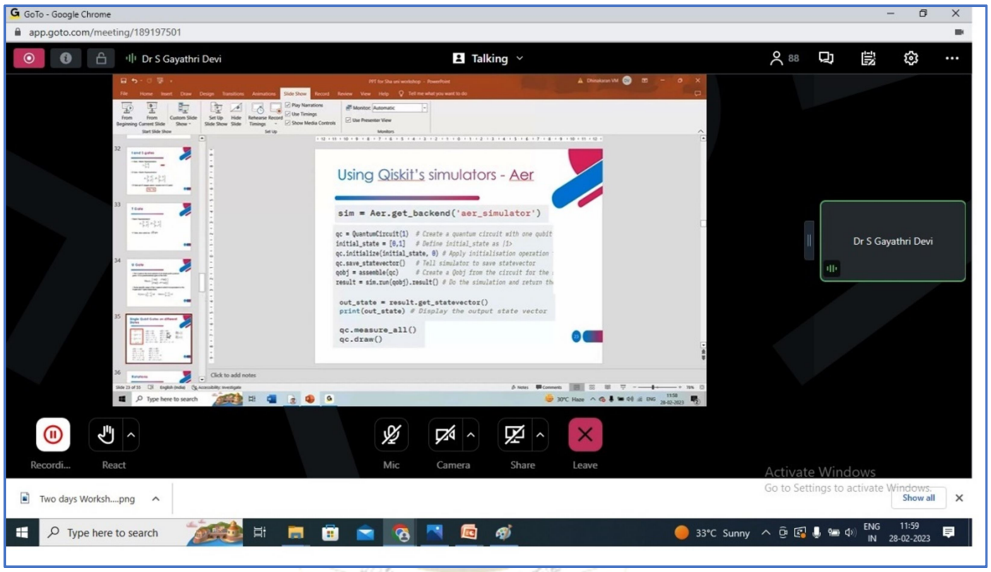
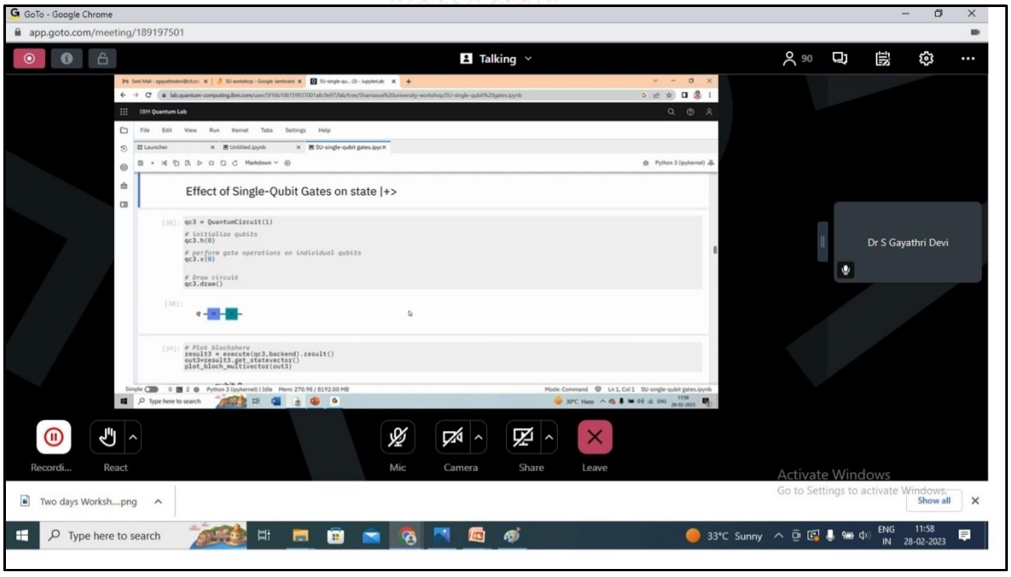
Day – I **Session – I** **10:15a.m to 12:00 Noon** Session by Resource Person –	**Two days' Workshop on Quantum Computing and Communication - Session - I** Feb 27, 2023, 8:35 PM – Feb 28, 2023, 12:35 AM (America/Los_Angeles) Please join my meeting from your computer, tablet or smartphone. https://meet.goto.com/189197501

Dr. S. Gayathri Devi	You can also dial in using your phone. Access Code: 189-197-501 United States: +1 (646) 749-3122 - One-touch: tel:+16467493122,,189197501# Get the app now and be ready when your first meeting starts: https://meet.goto.com/install
	Introduction to Quantum Computing Quantum computing is generally viewed as a field of study centered on developing computer technology based on the principles of quantum theory — the area of physics that explains how matter and energy behave at the atomic and subatomic level. Designing these quantum systems to interact with each-other in specific ways, while engineering unwanted interactions with the environment out (the DiVincenzo criteria) is the general approach to developing quantum computers at scale. Quantum computing is a unique technology because it isn't built on bits that are binary in nature, meaning that they're either zero or one. Instead, the technology is based on qubits. These are two-state quantum mechanical systems that can be part zero and part one at the same time. The quantum property of "superposition" when combined with "entanglement" allows N qubits to act as a group rather than exist in isolation, and therefore achieve exponentially higher information density (2^N) than the information density of a classical computer (N). Although quantum computers have a significant performance advantage, system fidelity remains a weak point. Qubits are highly susceptible to disturbances in their environment, making them prone to error. Correcting these errors requires redundant qubits for error correction and extensive correction codes, however useful applications of so-called Noisy Intermediate Scale Quantum devices, or "NISQ's" is proceeding very rapidly. Improving the fidelity of qubit operations is key to increasing the number of gates and the usefulness of quantum algorithms, as well as for implementing error correction schemes with reasonable qubit overhead

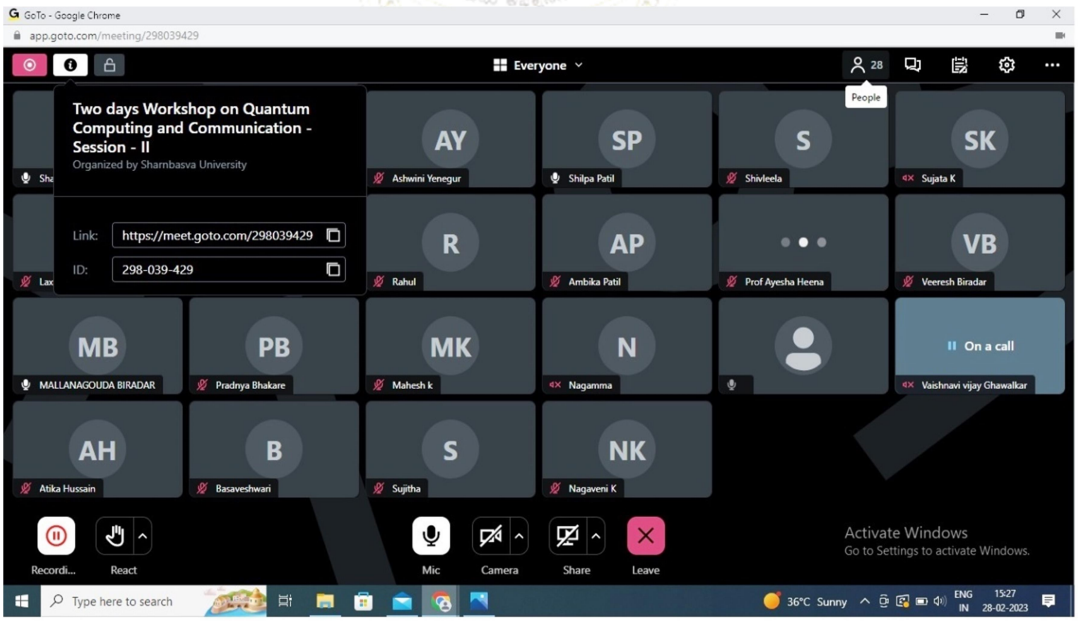


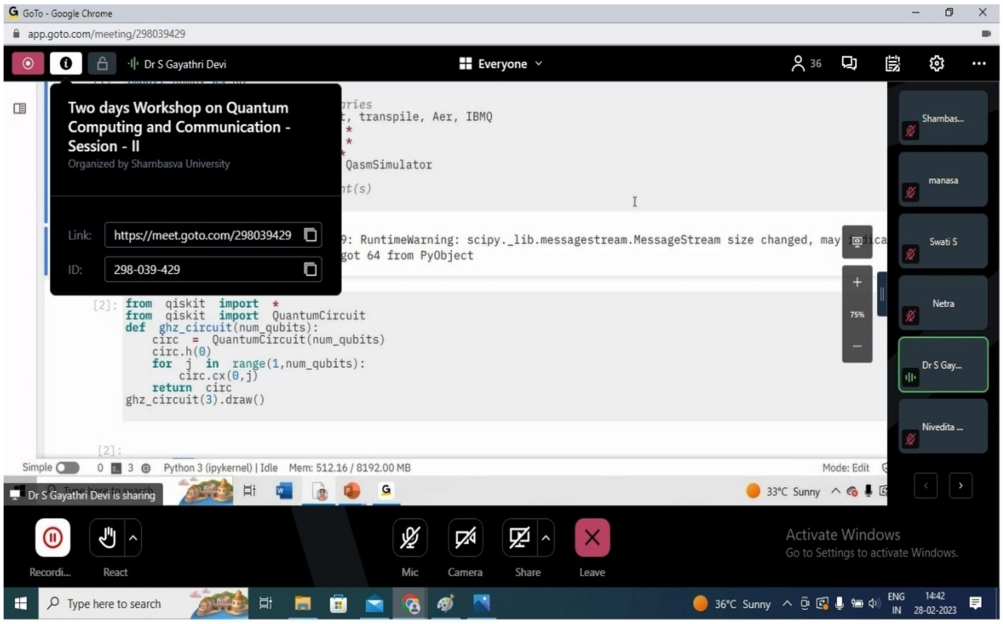


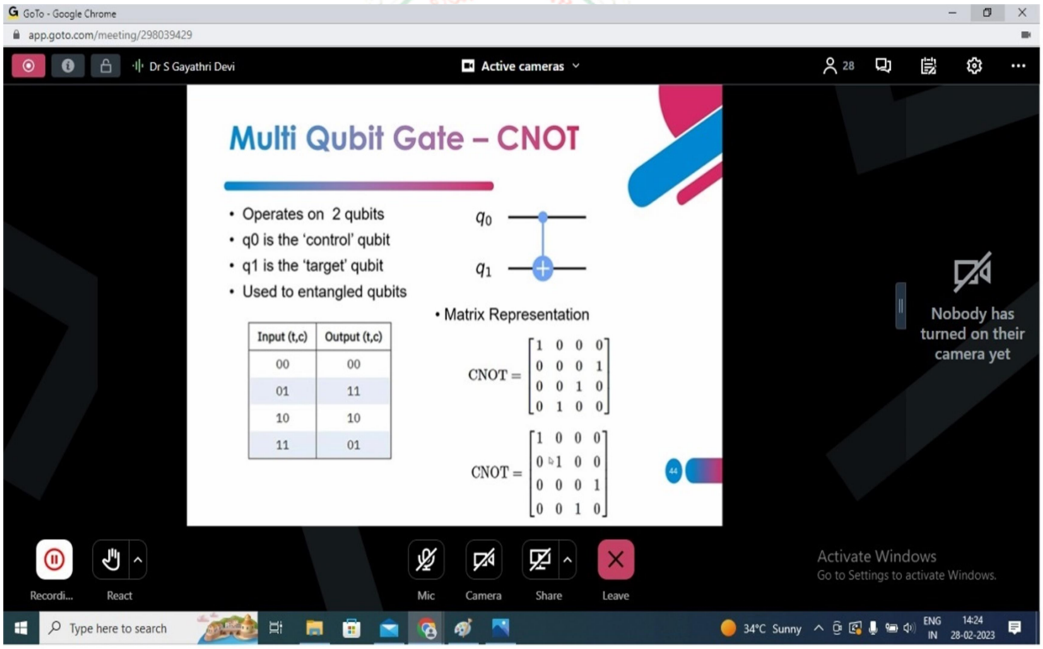
Contd. Session – I : Single-Qubit Gates	**<u>Single-Qubit Gates</u>** **<u>Classical Unary Logic Gates</u>** Alright! At this point, we've talked about what a qubit is, and we've talked about the Bloch Sphere which is the standard way to visualize qubits. Let's talk a bit about quantum computers, how they calculate things with qubits. In classical computers, we use logic gates as the fundamental

	structures that interact with input bits to produce output bits. Most of the time, we think of these input and output bits as different physical bits. We had four unary gates (gates that only take one bit as input): Clear, which always sets the output to 0 Mark, which always sets the output to 1 Identity, which sets the output to whatever the input was Negate (NOT), which sets the output to the opposite of the input
	
	

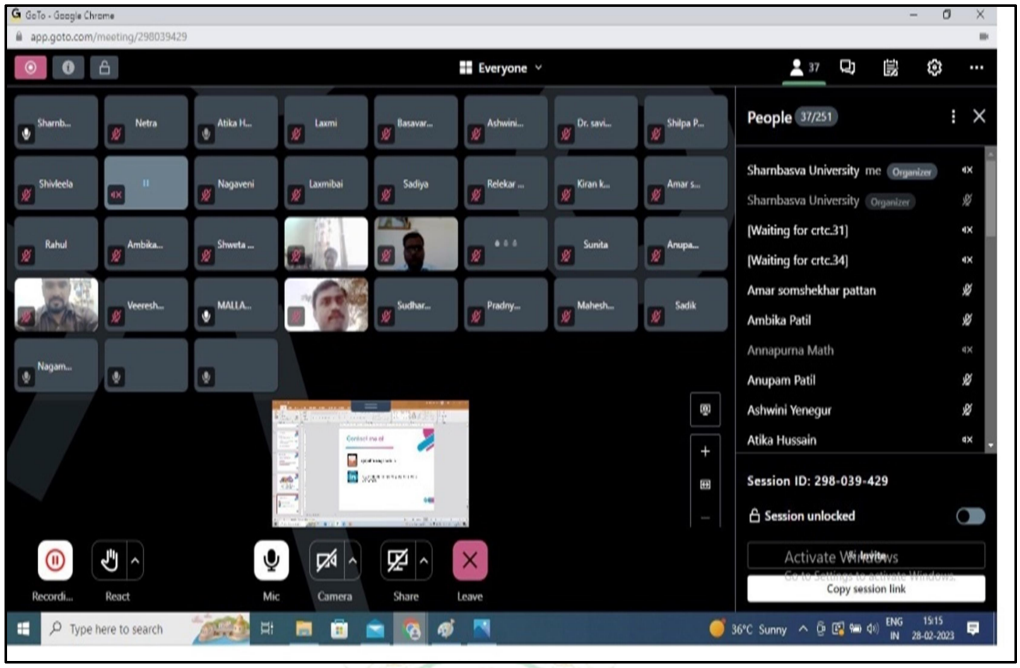
Day –I **Session – II** **2:00p.m to 4:00 p.m** **Session by Resource Person –** **Dr. S. Gayathri Devi**	**Two days Workshop on Quantum Computing and Communication - Session - II** **Feb 28, 2023, 12:00 – 4:00 AM (America/Los_Angeles)** Please join my meeting from your computer, tablet or smartphone. https://meet.goto.com/298039429 You can also dial in using your phone. Access Code: 298-039-429 United States: +1 (669) 224-3412 - One-touch: tel:+16692243412,,298039429# Get the app now and be ready when your first meeting starts: https://meet.goto.com/install
	Multi Qubits and its Simulation Single-qubit gates, even applied to registers, still only affect one qubit. These gates can be thought of like functions that only take one qubit in their input parameters. They may have more than one overall parameter, such as the arbitrary rotation gates, but they only have one parameter that is a qubit. In this section, we're going to look at gates that take more than one qubit in their input. The simplest multi-qubit gate is called the SWAP gate. It takes in two qubits and switches their states - that is, it puts the first qubit in the state of the second qubit, and vice-versa. The SWAP gate has this matrix.







Queries and Feedback – Day - I	**Few questionaries and queries were made.**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Amar somshekhar pattan
Ambika Patil
Annapurna Math
Anupam Patil
Ashwini Yenegur
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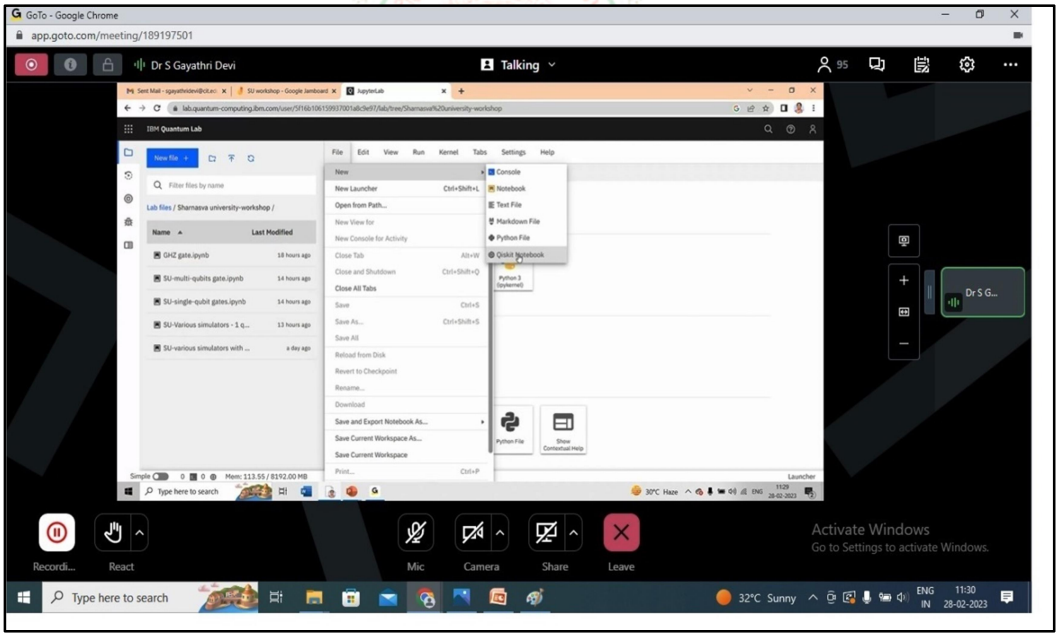
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Dr S Gayathri Devi
Talking
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IBM Quantum Lab
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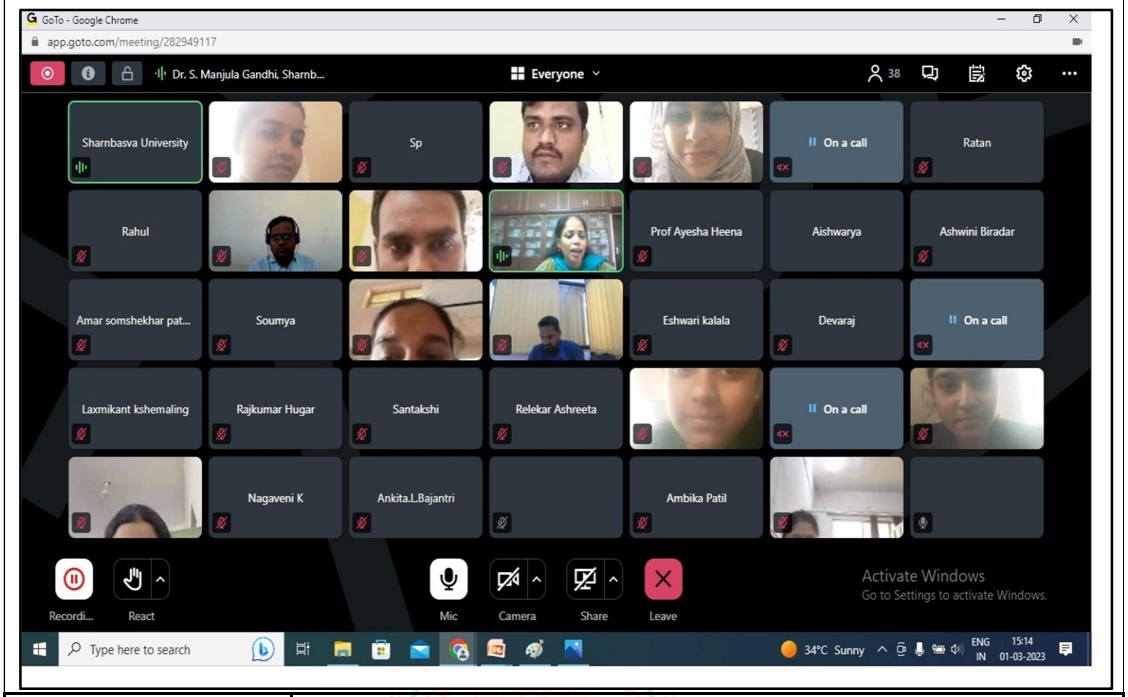
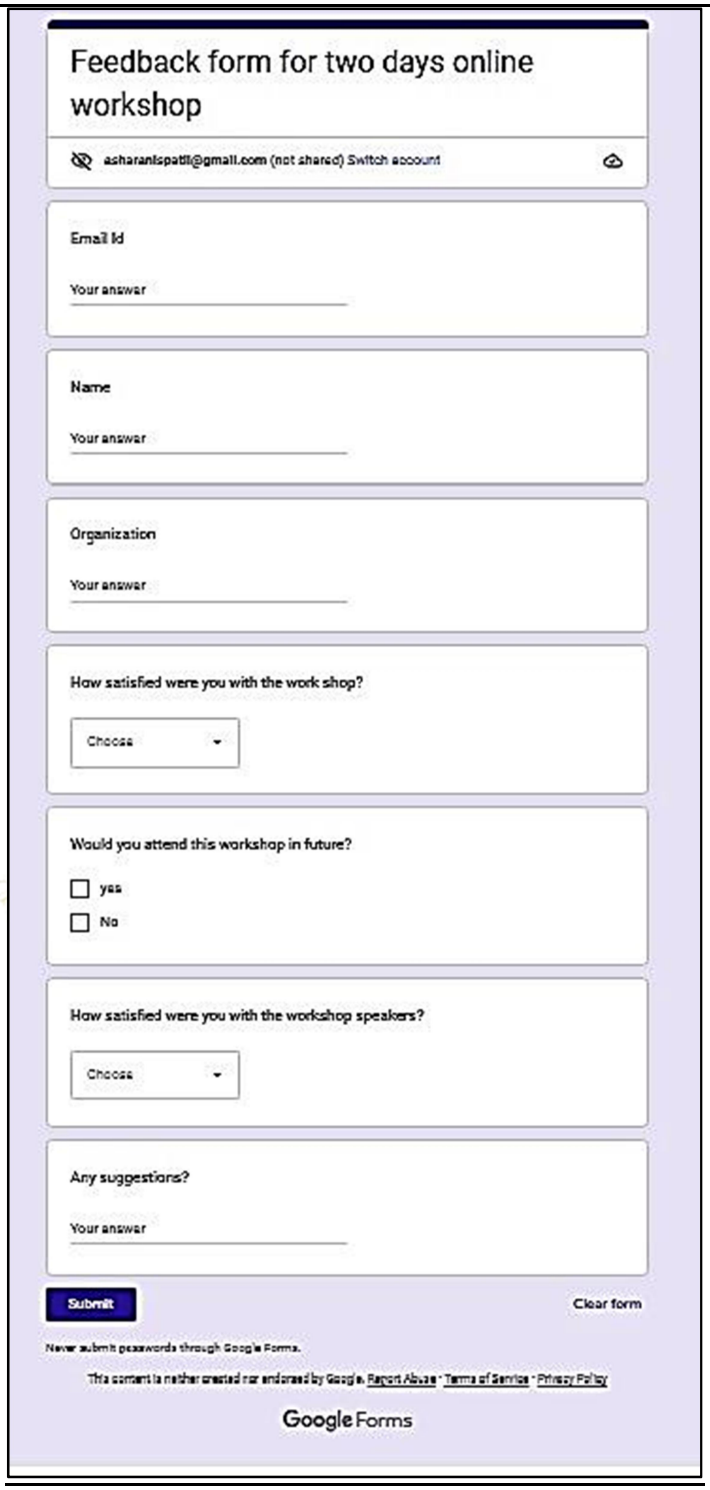
Photo Session Day – I



Feedback Link – Day – I	https://docs.google.com/forms/d/1XHbEDHJJHk01hD3lXGxrCJKfPz5ZyS-K0aPJkX6-IOw/edit **145 Responses**



Feedback form for two days online workshop

asharanispatil@gmail.com (not shared) Switch account

Email Id

Your answer

Name

Your answer

Organization

Your answer

How satisfied were you with the work shop?

Choose

Would you attend this workshop in future?

yes

No

How satisfied were you with the workshop speakers?

Choose

Any suggestions?

Your answer

Submit

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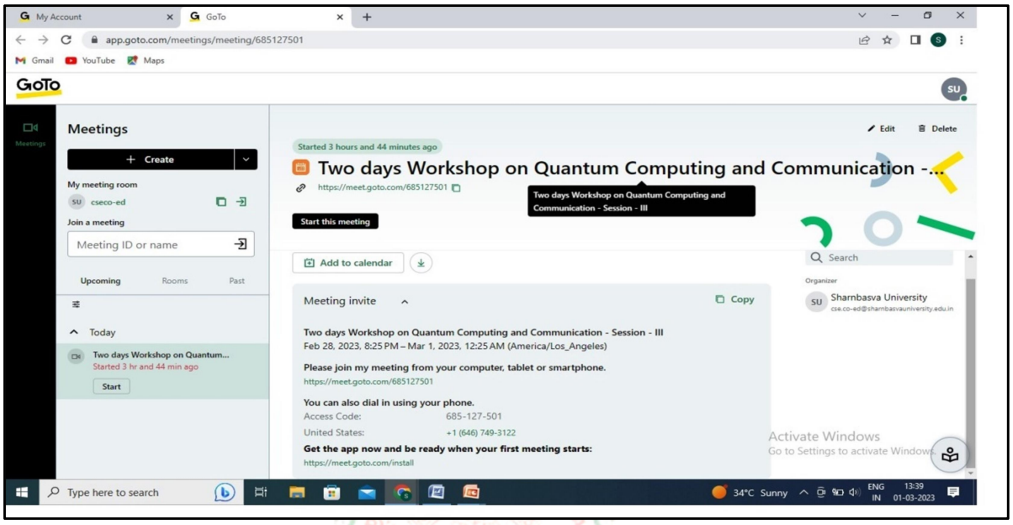
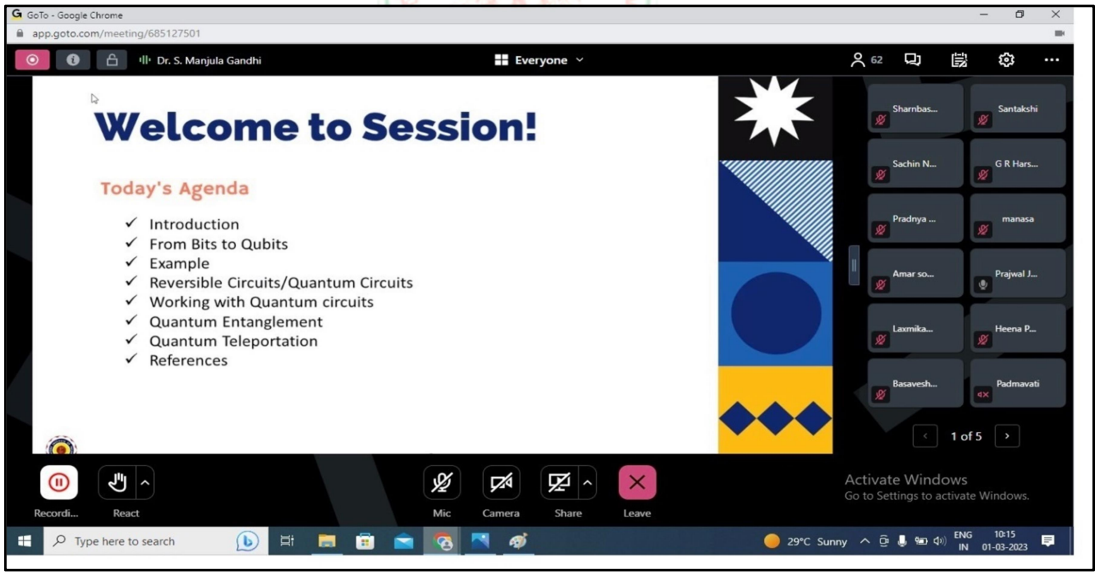
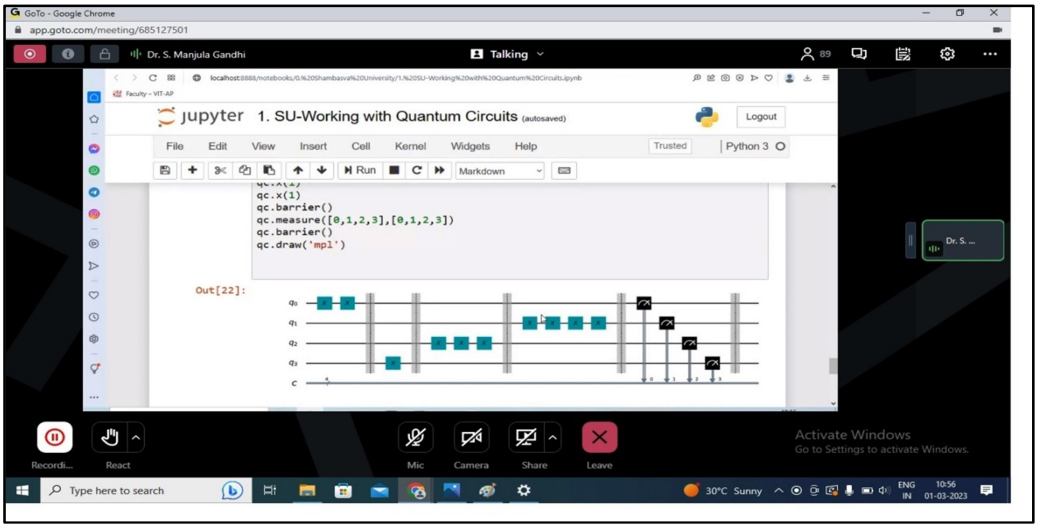
Day – II **Session – III**	**Two days' Workshop on Quantum Computing and Communication - Session - III**

10:00a.m to 12:00 Noon **Resource Person – Dr. S. Manjula Gandhi**	Feb 28, 2023, 8:25 PM – Mar 1, 2023, 12:25 AM (America/Los_Angeles) Please join my meeting from your computer, tablet or smartphone. https://meet.goto.com/685127501 You can also dial in using your phone. Access Code: 685-127-501 United States: +1 (646) 749-3122 - One-touch: tel:+16467493122,,685127501# Get the app now and be ready when your first meeting starts: https://meet.goto.com/install
	<u>Working with Quantum Circuits – Quantum Entanglement.</u> Quantum entanglement is a quantum mechanical phenomenon in which the quantum states of two or more objects have to be described with reference to each other, even though the individual objects may be spatially separated Quantum entanglement is at the heart of quantum physics. It offers unique insights into the fundamental principles of our physical world and it provides at the same time the basis of novel communication protocols, which allow efficient communication and computation beyond the capabilities of their classical counterparts. Prominent examples are quantum cryptography, the simultaneous distribution of a cryptographic key that is ultimately secured by the laws of quantum physics, quantum dense coding, a protocol to double the classically allowed capacity of a communication channel by encoding 2 bits of information per bit sent, or quantum teleportation/ the remote transfer of an arbitrary quantum state between distant locations. Further examples include entanglement-assisted classical communication to enhance the communication capacity in a noisy environment or methods to exploit the computational advantages provided by quantum entanglement for communication complexity problems. These quantum communication protocols utilize entanglement as a resource and form the basis for a new emerging quantum

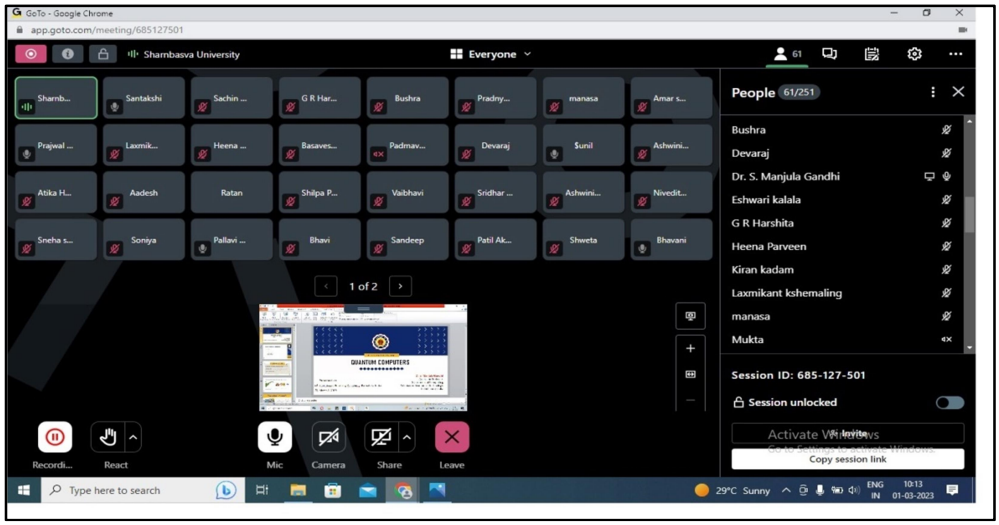
	information technology. To achieve quantum communication within a network it is a central task to be able to distribute and manipulate quantum entanglement, in principle up to a global scale. At present, the only suitable system for transmitting information in long-distance quantum communication is photons.







Day – II **Session – IV** **2:00p.m to 3:30p.m** **Resource Person – Dr. S. Manjula Gandhi**	**Two days Workshop on Quantum Computing and Communication - Session - IV** Mar 1, 2023, 12:15 – 4:15 AM (America/Los_Angeles) Please join my meeting from your computer, tablet or smartphone. https://meet.goto.com/282949117 You can also dial in using your phone. Access Code: 282-949-117 United States: +1 (224) 501-3412 - One-touch: tel:+12245013412,,282949117# Get the app now and be ready when your first meeting starts: https://meet.goto.com/install
	<u>Quantum Teleportation & Multi Qubits and its Simulation</u> Quantum teleportation: a quantum information protocol by which the unknown quantum state of one particle can be transferred to another distant particle, using a pair of entangled particles, a projective measurement, and exchange of two bits of classical information Quantum algorithms can be exemplified as quantum circuits, merely comparable to conventional computing. Every qubit may be signified as a line, as the usual bits are, and they can be operated and entangled with each other across the routine of quantum gates, corresponding to logic gates.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app.goto.com/meeting/685127501
Sharnbasva University
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Bushra
Devaraj
Dr. S. Manjula Gandhi
Eshwari kalala
G R Harshita
Heena Parveen
Kiran kadam
Laxmikant kshemaling
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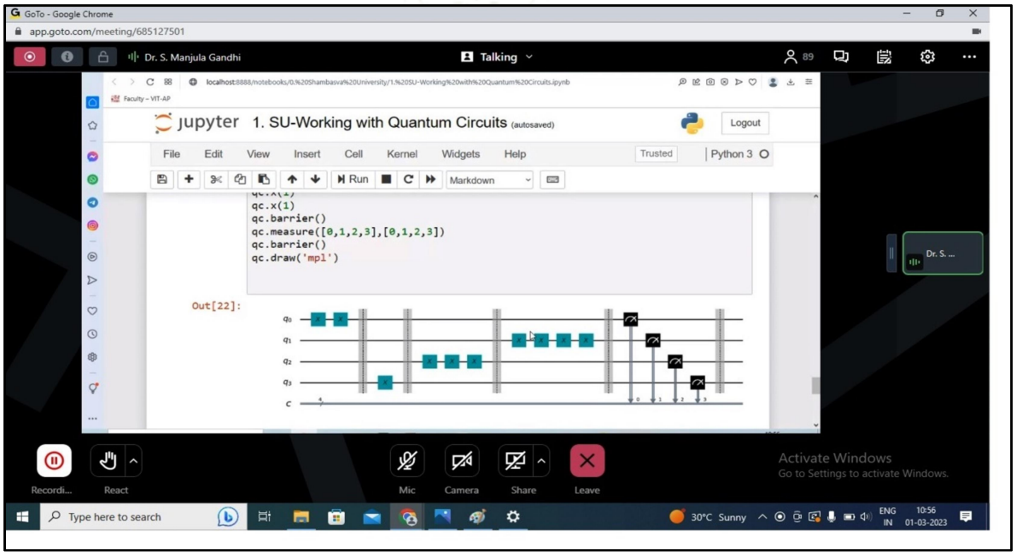
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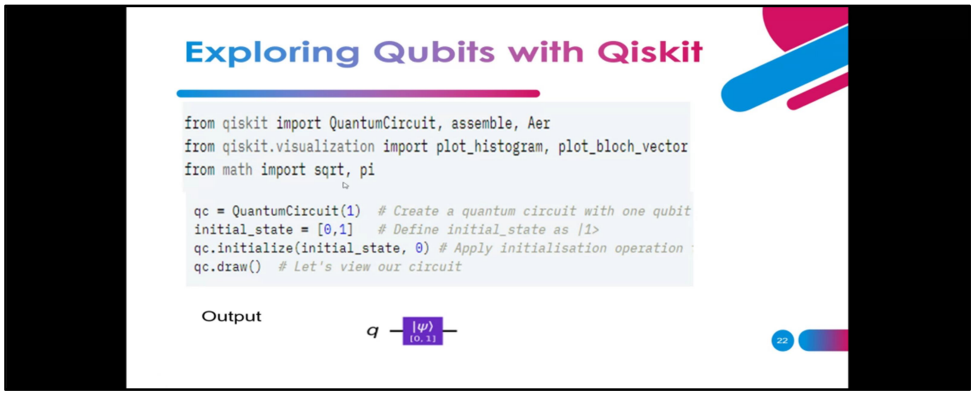
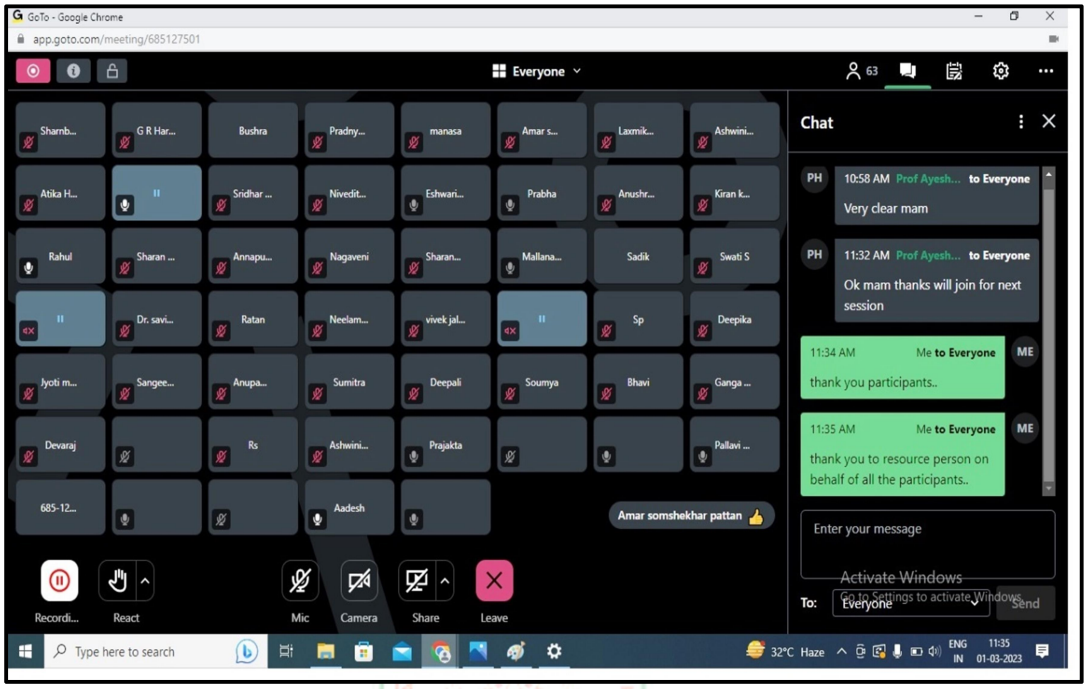
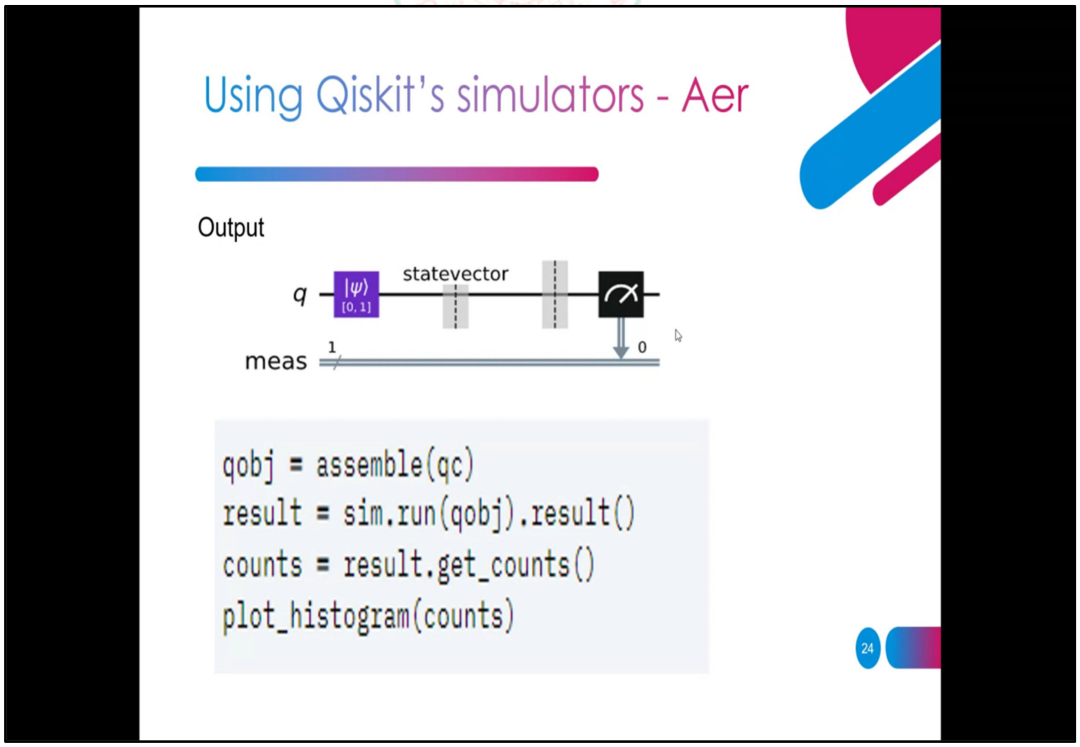
Dr. S. Manjula Gandhi
Talking
jupyter 1. SU-Working with Quantum Circuits (autosaved)
Logout
File Edit View Insert Cell Kernel Widgets Help
Trusted
Python 3
Run
Markdown
qc.x(1)
qc.barrier()
qc.measure([0,1,2,3],[0,1,2,3])
qc.barrier()
qc.draw('mpl')
Out[22]:
Recordi...
React
Mic
Camera
Share
Leave
Activate Windows
Go to Settings to activate Windows.
Type here to search
30°C Sunny
ENG IN
10:56
01-03-2023


Exploring Qubits with Qiskit
from qiskit import QuantumCircuit, assemble, Aer
from qiskit.visualization import plot_histogram, plot_bloch_vector
from math import sqrt, pi
qc = QuantumCircuit(1) # Create a quantum circuit with one qubit
initial_state = [0,1] # Define initial_state as |1>
qc.initialize(initial_state, 0) # Apply initialisation operation
qc.draw() # Let's view our circuit
Output
q
|ψ⟩
[0, 1]
22

Queries and Feedback – Day - II	**Few questionaries' and queries were made.**





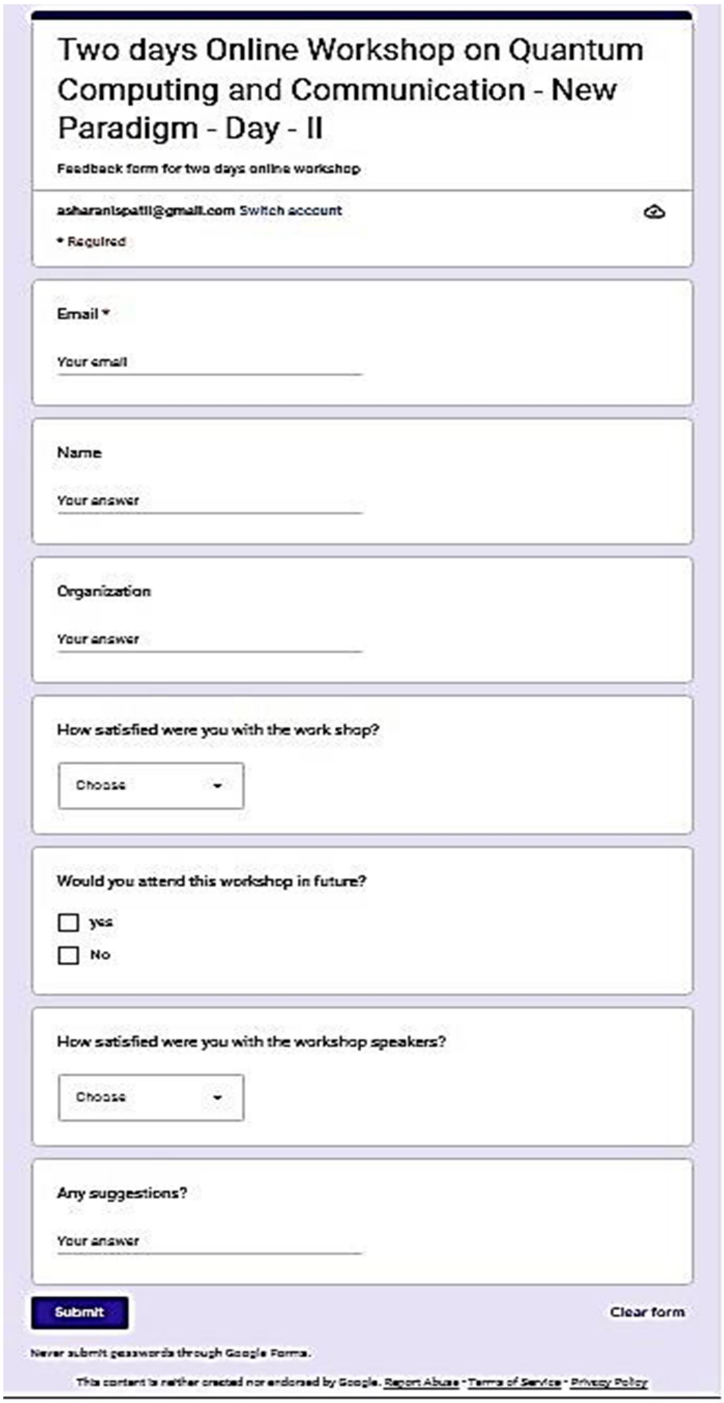
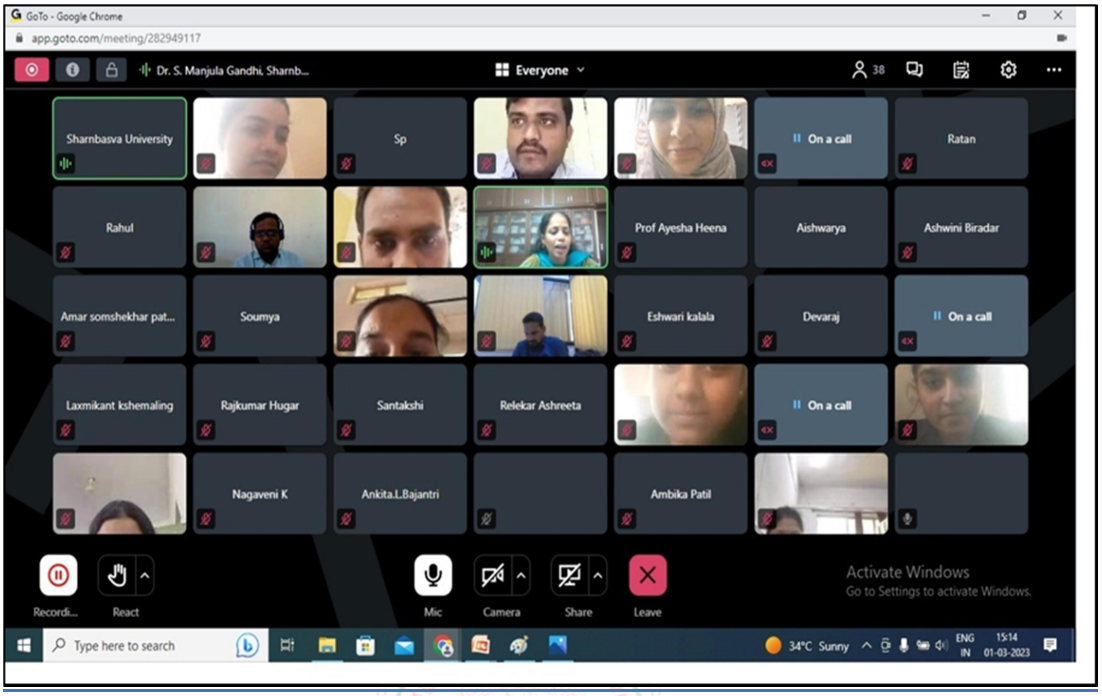
Feedback Link – Day – II	https://forms.gle/2si7BdA767wvkdh2A **140 Responses** 

Photo Session – Day – II



Appreciation Letter **Thanking Letter** **Attendance Letter**	The entire three letters with certificate as resource person along the remuneration were provided to both the resource person.
Feedback Link with E-Certificate	**https://forms.gle/LUAfzHSXo2Bw1Ljq8** **155 Certificates were Downloaded**
E-Certificate	

(Under the agesis of centenary Celebrated Sharnbasveshwar Vidya Vardhaka Sangha, Kalaburagi – 585103, Karnataka, India)

Two Day Online Workshop on

"Quantum Computing and Communication: New Paradigm"

On the view of

"DigitALL: Innovation & Technology for Gender Equality" –

International Women's Day Week 2023 Celebration

In association with IEEE WIE Affinity Group Bangalore Section, IEEE Bangalore Section,

On 28th February 2023 & 1st March 2023

CERTIFICATE

This is to Certify that Mr./Ms./Mrs./Dr./Prof./ **Asharani Patil of Sharnbasva University Kalaburagi** attended and participated in Two Day Online Workshop on "**Quantum Computing and Communication: New Paradigm**" On the view of "DigitALL: Innovation & Technology for Gender Equality" - International Women's Day Week 2023 Celebration in association with IEEE WIE Affinity Group Bangalore Section, IEEE Bangalore Section Karnataka, India Organized by Department of Electronics & Communication Engg., Faculty of Engineering & Technology – Exclusively for Women, Sharnbasva University, Kalaburagi, Karnataka India. Certificate ID CVERCQ-CE000010

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On 28th February 2023 & 1st March 2023

CERTIFICATE

This is to certify ***Dr. S Manjula Gandhi,*** Associate Professor, Department of Computing, **Coimbatore Institute of Technology, Coimbatore, Tamil Nadu, India** have been as Resource Person-Speaker in Two Day Online Workshop on "**Quantum Computing and Communication: New Paradigm**" On the view of "DigitALL: Innovation & Technology for Gender Equality" - International Women's Day Week 2023 Celebration in association with IEEE WIE Affinity Group Bangalore Section, IEEE Bangalore Section Karnataka, India Organized by Department of Electronics & Communication Engg., Faculty of Engineering & Technology – Exclusively for Women, Sharnbasva University, Kalaburagi, Karnataka India.

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Two Day Online Workshop on

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In association with IEEE WIE Affinity Group Bangalore Section, IEEE Bangalore Section

On 28th February 2023 & 1st March 2023

CERTIFICATE

This is to certify ***Dr. S Gayathri Devi,*** Assistant Professor, Department of Computing, **Coimbatore Institute of Technology, Coimbatore, Tamil Nadu, India** have been as Resource Person- Speaker in Two Day Online Workshop on **"Quantum Computing and Communication: New Paradigm"** On the view of "DigitALL: Innovation & Technology for Gender Equality" - International Women's Day Week 2023 Celebration in association with IEEE WIE Affinity Group Bangalore Section, IEEE Bangalore Section Karnataka, India Organized by Department of Electronics & Communication Engg., Faculty of Engineering & Technology – Exclusively for Women, Sharnbasva University, Kalaburagi, Karnataka India.

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Activity Incharge **Chairperson**

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