

Honourable Chairman, Board of Governors; Admirable Director Prof Gautam Biswas; Eminent Members of the Board and Senate; Erudite Deans, Heads, Professors and Academics; Resourceful Registrar and Non-academic staff; Distinguished Invitees; Dear Graduating Students and their Parents and spouses; Friends from the Media; Ladies and Gentlemen,

1. I deem it a proud privilege to participate in this momentous occasion and deliver the 21st Convocation address at this modern temple of learning that sprung up quite rapidly in the ancient city of temples. Evolving as a place of pride in the region as the sixth IIT, your institute scaled up rapidly and commendably with sustained academic excellence and a national ranking next only to the first generation IITs. Let me offer accolades to everyone who gave their mind and might for this achievement.
2. This forenoon, your Institute offers to the nation yet another batch of bright, inspired, sharp and ebullient professionals and future leaders. As you step out from the portals of this Institute and walk the path of professional success, do remember to make your parents and Alma Mater proud. The world opens up ahead of you and you re-enter it with even greater aspirations than when you came in. The onus is on you to find ways and means to contribute to the society that saw you grow to your stature.

3. Friends, every one of us must have a dream of the future India, a nation of pre-eminence in the global economy and a level of leadership in science and technology that would propel India through that growth curve.
  - 3.1. India's resilience to the economic shock of the past decade and a recapture of growth rates of over 7%, have been commendable. The UN Reports of the past few years on 'World Economic Situation and Prospects' indicate that India has positioned itself as the most dynamic emerging economy amongst the largest countries.
  - 3.2. Let me recall from a 'PWC' report of 2014 titled "Future of India-the Winning Leap" which surmises that if India can achieve a CAGR of 9%, it could build a 10 trillion USD economy in next 20 years. That could make India the world's third largest economy in 2034, i.e. after the US and China.
4. Technology advances exponentially. Advances in material science, artificial intelligence, automation and robotics, optics and mechatronics lead to seismic shifts in manufacturing technologies. Convergence of neuroscience and the physical sciences of engineering, information technology and robotics in a creative alliance, is one of the most exciting developments of the recent times.
  - 4.1. The term 'Disruptive Technologies' drew much attention in 2013 when McKinsey Global Institute short-listed a dozen technologies [such as mobile internet, automation

of knowledge work, the Internet of Things, cloud technology, advanced robotics; autonomous and near-autonomous vehicles, next-generation genomics, energy storage devices or systems, 3D printing, advanced materials, Advanced oil and gas exploration and recovery; renewable energy], with high potential to drive substantial economic impact and disruption by 2025.

- 4.2. 'Industry 4.0' or '4IR' are the modern-day jargons emanating from the concept of 'The Fourth Industrial Revolution' enunciated in 2015 by the renowned German Engineer and Economist Klaus Schwab of World Economic Forum.
- 4.3. In 2018, India was ranked at 58 (among 140 nations) on Global Competitiveness Index measured in the context of 4IR. On Global Innovation Index brought out by INSEAD Business School and World Intellectual Property Organisation, India stays at 57 (amongst 126 nations) of the latest report of 2018. Also, it is well-known that Indians elsewhere stand high on innovation and they are driving innovative projects across the globe.
5. As a nation, we a long way to move up in science, technology and innovation, even while being proud of several accomplishments of global standards and high national impact, essentially emanating from certain islands of excellence'.

- 5.1. It is a startling that India continues to be a major importer of capital goods, aircraft, modern transport systems, electronic components and products, computers, biomedical equipment as well as vital systems for strategic sector. When the world moved ahead with engineering and innovation since 1980's, the Indian Industry started losing competitive edge due to slow adoption of modern technology from either foreign sources or through indigenous S&T efforts, albeit a few exceptions in the strategic sectors.
  - 5.2. Absence of a convergence of purpose between S&T agencies and the rest of the essential players of the value chain prompt repeated imports and lesser growth in our manufacturing sector. A positive trend is that some of the major Indian industrial houses have begun to invest in their own technology development centres.
6. The national challenge is how well we channelize their inventive power of our demographic dividend in the frontiers of science and inter-disciplinary team-efforts on relevant and substantial problems besides inspiring and facilitating them to generate scientific and technical knowledge that would manifest as cost-effective and reliable processes, products and services with utility in the domestic and global market place. Their renewed interest for pursuit and engagement in science is quite discernible as one interacts with them across the length and breadth of the country. So also, we have a sterling political leadership, a renewed industrial urge, an

enabling ambience and a will-to-do-it by all stakeholders for a leap forward.

7. While economic growth denotes positive change in the real output in a particular span of time, any developing economy would focus on economic development that hinges on equitable distribution of wealth and improvement in living standards for all. Alongside, the environmental imperative for sustainability over a long time horizon has been ingrained into the governance processes globally.
8. Let me dwell on India's space endeavour that is benchmarked among the global space comity only next to USA, Russia, European Space Agency (ESA), Japan and China and significantly a role model for reaching the benefits of this frontline technology for economic growth, national development and environmental sustainability.
  - 8.1. Six decades ago, Space exploration started as a symbol of strength in the bipolar world besides an exciting pursuit of knowledge enrichment. The word Rocket Science is used to denote something that is difficult to comprehend. Space missions are exciting but exacting too. The technology is quite complex and these and large systems have to operate for long in a harsh and somewhat uncharted environment of outer space. Risk management and failure recovery are part of our working. Impact of these space systems on stakeholders - in government, industry and public at large - is quite high.

- 8.2. India too hurled into this tough domain with an indomitable national vision. An enterprising scientist, Dr. Sarabhai in his early 40's, and hailing from a renowned industrial family, saw in Space not merely a new avenue of exciting Science. To him, it was a great opportunity to harness science and technology to the important task of transforming the life of the country and its people. That became an indomitable national vision.
- 8.3. A legendary technologist and transformational leader Prof. Satish Dhawan stepped in when Dr. Sarabhai departed. A strong organizational edifice was created in 1972 and Sarabhai's vision was executed with commendable diligence, focus and national significance. ISRO went on to build national Systems using space technology and concomitant institutional tie ups with all stakeholders. We recognized the subtle difference between space endeavour and space enterprise. Space commerce became a prominent factor and a vibrant space industry emerged. We became sensitive to space policy, space law and space economics.
- 8.4. To my mind, these two legendary scientists steering ISRO in that sequence, made the difference for shaping India's odyssey in 'rocket science' and an organisational culture often quoted as 'ISRO way of working'. The saga continues with each generation striving for the next level of excellence by extending its limits and exploring new possibilities

- 8.5. The hallmark of India has been the focus to help humankind through Earth-oriented Satellites for communication, remote sensing and navigation along with an effective institutional tie up with all stakeholders. Self-reliance has been our obsession, not just an objective. That is evident from our strides in satellite technology and launcher technology. India's space industry is growing in value chain. Capacity building in academia has been a priority to foster front-line research. Chandrayaan-1 and Mangalyaan were India's inflection points on convergence of space science, technology, engineering and mathematics for precise navigation for deep space missions. Lunar lander of Chandrayaan-2 will be a landmark soon. Gaganyaan is the next turning point, commencing human spaceflight to the Earth's orbit.
- 8.6. What is striking there is the team excellence with a sublime blend of inventive power of youth and wisdom of elders brought to the table. That helps us to address the complex and large system of systems in rocket science that have to work in harsh space environment that are partially charted. That emboldens us to develop systemic resilience to mission failures, technology denials and high risk ventures.
9. Let me wrap up. Four decades ago, I too came out of a graduation process like any one of you when ISRO was still in its formative phase. I chose to continue to be engaged in this

exciting, challenging and rewarding field. Today, I feel that there has been a purpose in my life.

10. Friends, you hold the key to leap forward or even to leap-frog or to make impossible into possible. 'Knowing' and 'Doing' are important. But 'Being' what you are makes a difference in life. Amidst your pursuit for exciting scientific and technological pursuits, enterprising business endeavours and entrepreneurial excellence, you should ponder on the avenues available to contribute for the nation and humanity at large. Our conviction about our life and its purpose and our value system would help us to perform our duty to this motherland and the humanity as *Nishkama karma*. Each one of us can make a difference for the country and each one of us should strive to leave a legacy when you leave this world.
11. Finally, I would like to quote Swami Vivekananda to wrap it up *“Mind you, this is life's experience: if you really want the good of others, the whole universe may stand against you and still cannot hurt you. It must crumble before the power of the Lord Himself in you if you are sincere and really unselfish.”*
12. May your life be a bright one, and may its lustre brighten the entire country! May the Almighty always be with you in your journey of success!

Thank you and God bless you!