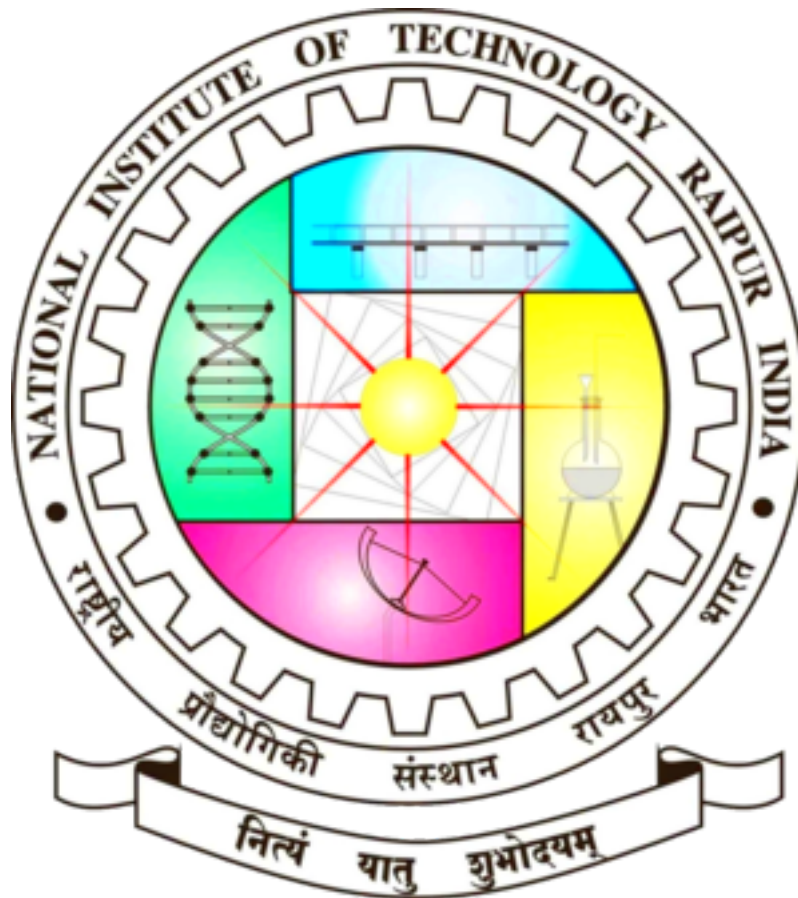# BASIC BIOMEDICAL ENGINEERING (5 SOLUTIONS TO COVID-19 BY BIOMEDICAL ENGINEERS...)

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1   Introduction

The COVID-19 pandemic has shown how vulnerabilities in health systems can have profound implications for health, economic progress, trust in governments, and social cohesion.For the first time in history, a health crisis has shut down the entire global economy, painfully demonstrating how inseparable healthcare and the economy have become.

2   Role of biomedical engineers in Covid-19 pandemic

Biomedical engineering (BME) is considered a rising field of medical sciences, it has demonstrated its pivotal role in nurturing the maturation of COVID-19 diagnostic technologies. Within a very short period of time, BME research applied to COVID-19 diagnosis has advanced with ever-increasing knowledge and inventions, especially in adapting available virus detection technologies into clinical practice and exploiting the power of interdisciplinary research to design novel diagnostic tools or improve the detection efficiency. To assist the development of BME in COVID-19 diagnosis, this review highlights the most recent diagnostic approaches and evaluates the potential of each research direction in the context of the pandemic.Advancements in medical technology have improved the quality of patient care for coronavirus patients. To use these technologies effectively, hospitals and treatment facilities need qualified biomedical engineers. These devices have a direct impact on the survival rate of critical coronavirus cases. Any while using such equipment can hamper the health of patients and even lead to fatalities. Hence, the need for biomedical engineers is certainly critical and evident at this juncture of the global health crisis.

3   5 SOLUTIONS TO COVID-19 PANDEMIC BY BIOMEDICAL ENGINEERS

3.1   TELEHEALTH TECHNOLOGIES-

The Covid-19 pandemic is posing unique challenges to healthcare delivery. States across the world are shutting down non-essential services and in several cases issuing stay-at-home restrictive orders to flatten the curve and help overcrowded hospitals remain functional. Alternative technologies, conducive to self quarantine, could therefore offer an essential link between patients and clinicians, circumventing the need to travel to overburdened hospitals.Telehealth technologies allow patients to be seen and diagnosed remotely by doctors via an audiovisual, realtime, two-way interactive communication system.

3.2   GENE THERAPY-

In the case of Covid-19, it only took two weeks from public health officials reporting the virus to the World Health Organization (WHO) for scientists to isolate the virus and figure out the full sequence of its genetic material. The disclosure of this genetic code may shed light on the origins and the spread of the disease, and also point to potential pharmaceutical targets for drug development.Despite their experimental nature, gene-editing technologies could help in the fight against increasingly resistant bacterial infections and rapidly mutating viruses. They could facilitate a better understanding of host-pathogen interactions and improve diagnosis, or potentially provide a new way to treat infectious disease in a faster and less expensive manner.

3.3   DEVELOPMENT OF VACCINES-

Vaccines save millions of lives each year. The development of safe and effective COVID-19 vaccines are a crucial step in helping us get back to doing more of the things we enjoy with the people we love.Vaccines work by mimicking an infectious agent – viruses, bacteria or other microorganisms that can cause a disease. This 'teaches' our immune system to rapidly and effectively respond against it.Other COVID-19 vaccines have been developed using new approaches, which are called messenger RNA, or mRNA, vaccines. Instead of introducing antigens (a substance that causes your immune system to produce antibodies), mRNA vaccines give our body the genetic code it needs to allow our immune system to produce the antigen itself. mRNA vaccine technology has been studied for several decades. They contain no live virus and do not interfere with human DNA.

3.4   IOT BASED AT HOME HEALTH MONITORING SYSTEMS-

During the ongoing COVID-19 pandemic, Internet of Things- (IoT-) based health monitoring systems are potentially immensely beneficial for COVID-19 patients. This study presents an IoT-based system that is a real-time health monitoring system utilizing the measured values of body temperature, pulse rate, and oxygen saturation of the patients, which are the most important measurements required for critical care. This system has a liquid crystal display (LCD) that shows the measured temperature, pulse rate, and oxygen saturation level and can be easily synchronized with a mobile application for instant access. This device was used by five people aged between 23 and 56 years. It provided precise values for all features that have been included in this system. For the pulse rate, the measured values for the different subjects were comparable. The measured physiological data were different for different test subjects. All of these measured values were accurate compared to those of other commer-

cially available devices.

3.5   BUILIDING APPLICATIONS FOR REOMTE COVID DETECTION-

Instead of seeing their patients in person, an app called Docdot allows doctors to track patients' vital signs virtually and detect COVID symptoms with medical-grade accuracy. The app uses AI-powered light signal processing technology to convert light reflected from blood vessels in the face into accurate real-time vital sign measurements, including heart rate and oxygen saturation. Within as little as 45 seconds, the results can be retrieved and used to diagnose COVID-19 and other conditions. The technology not only allows doctors to care for individual patients remotely, but the data is also collected in real time for up-to-date information about COVID cases and hotspots.

3.6   3D PRINTED NASAL SWABS-

Faced with a shortage of testing supplies around the world, AI software company Axial3D designed 3D printed nasal swabs for COVID tests. The 3D printed swabs are not only quick to produce, but they also keep samples more intact than traditional swabs. With more access to testing swabs, clinics around the world can better monitor the spread of the virus.