

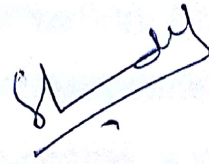
CERTIFICATE

This is certify that, the project entitled "DESIGN AND ANALYSIS OF FLEXIBLE PROSTHETIC LEG FOR NORMAL WALKING" is bonafide work done under our guidance and is submitted by **Digambar D. Badole** to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur for the partial fulfillment of requirement for the award of post-graduation degree, **Master of Technology (M. Tech.) in Mechanical Engineering Design (M.E.D.)**.



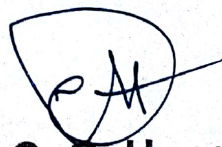
Prof. B. D. Sarode

Co - Guide



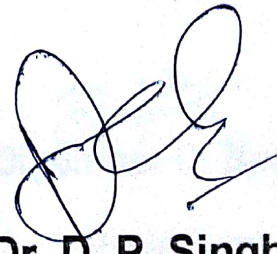
Dr. S. K. Choudhary

Guide



Dr. C. C. Handa

Head of Department
Deptt. of Mech. Engg.
K.D.K. College of Engg., Nagpur-09.



Dr. D. P. Singh

Principal
K.D.K. College of Engg
NAGPUR

ABSTRACT

In medical field, prosthesis is an artificial device that replaces a missing body part, which may be lost through trauma, disease, or congenital conditions. Prosthetic amputee rehabilitation is primarily coordinated by a prosthetics and an inter-disciplinary team of health care professionals including psychiatrists, surgeons, physical therapists, and occupational therapists.

The conventional prosthesis designs of fixed artificial legs are simple in construction; it consists of two basic parts, a socket which connects residual leg with another part of artificial leg. They only provide support to the leg but they do not fully anticipate in the movement of the leg. Due to the fixed nature of leg it creates discomfort to the user. There is a need for design a new prosthesis leg with knee and ankle joints to perform movements and provide comfort to the user.

In this project, the existing flexible artificial leg designed and analyzed and after it we modified the existing design according to the objectives of the project.

For designing prosthetic leg, CAD software used and analysis was done on FEA software HYPERMESH and NASTRAN. CAD model was meshed on hyper mesh, and static analysis was done on NASTRAN. The scope of this project is limited to developing a flexible artificial leg to improve the comfort for medical field.

From the results of the design, it is concluded that stresses obtained in static analysis within the limits; hence the design of modified prosthesis leg is safe.

CONCLUSION & FUTURE SCOPE OF WORK

In this world, there are millions of handicap people those who don't have leg. Also many people lost their leg in accidents. Such people are using prosthetic leg which has no knee joints and ankle joints. Hence there is a lot of discomfort while walking. This project is the outcome of improving the performance and comfort of prosthetic leg by using finite element analysis technique.

7.1 CONCLUSION

Prosthetic leg with fixed ankle, give rise to uncomfoting. To avoid this problem and for making walking styles smoothly and convenient prosthetic leg bodies need to be designed with high design standardization.

Considering this problem, project was successfully executed. In stipulated time frame. It involved gathering the structural design data from a exhibition which was part of celebrating 125th birth anniversary of Dr. B. R. Ambedkar as part of 'Panchtirth' announced by Prime Minister Narendra Modi in April 2016, at Yashwant Stadium, Sitabardi, Nagpur.

In this project, a prosthetic leg designed with ankle and knee joint and carried out static FEA analysis of the existing and modified CAD model of prosthetic leg using HYPERMESH and FEA software Nastran. Existing design is safe for human weight but there is no movement available for walking, to overcome this modified design is modeled with knee and ankle movements. Carried out several analysis for different thickness of lower leg to obtain the safe design. For thickness of 7.5mm the results shown are within the limits.

During analysis, 3 different loading forces are applied on the modified leg, at different angle of 0, 15 and 30 degrees. At material thickness 7.5mm, the design of the modified leg with knee joint and flexible ankle was found to be safe. The successful completion of this project, millions of people will be benefited by new design of prosthetic leg with flexible ankle and knee joint by improving their comfort level.

7.2 FUTURE SCOPE OF WORK

Although a lot of work has been done to design a perfect standard design of Prosthetic leg, there still remains undeniable scope of future enhancement and improvement in this design. These improvements if pursued will lead to better operation, better design, and reduced cost, diverse application in different engineering fields.

Thus with these benefits in sight, the scope of the future work on this Prosthetic leg cannot be ignored. Following are the list of activities that can be individually or collectively carried out by researchers to achieve the above mentioned benefits.

- Most of the times structures fail due to fatigue loading, hence there is a scope for improvement of the fatigue life of Prosthetic leg.
- The structure of the body can be designed with different material than structural steel such as composites, this will reduce the weight of the body significantly

If these future research activities are carried out by the researchers it will also benefit the research associate to get insight into the design aspect of Prosthetic leg design improvement.