VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"Jnana Sangama" Belagavi – 590 010

PROJECT REPORT ON

"COORDINATE TRANSFORMATION OF SATELLITE ORBITS FOR IONOSPHERIC PIERCE POINTS: COMPUTATION AND VISUALIZATION"

Submitted in partial fulfillment of the requirements for the award of degree

BACHELOR OF ENGINEERING
IN
ELECTRONICS & COMMUNICATION ENGINEERING

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CERTIFICATE

Certified that the project work entitled "**COORDINATE TRANSFORMATION OF SATELLITE ORBITS FOR IONOSPHERIC PIERCE POINTS: COMPUTATION AND VISUALIZATION**" is a bonafide work carried out by

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In partial fulfillment for the award of BACHELOR of ENGINEERING in **ELECTRONICS & COMMUNICATION ENGINEERING** of the **VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI** during the year 2017-2018. It is certified that all corrections/suggestions indicated for internal assessment have been incorporated in the report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of project work prescribed for the Bachelor of Engineering degree.

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ABSTRACT

The ionosphere is the ionized part of earth's upper atmosphere, from about 60 km (37 mi) to 1,000 km (620 mi) altitude, a region that includes the thermosphere and parts of the mesosphere and exosphere. The ionosphere is ionized by solar radiation, plays an important role in atmospheric electricity. GNSS are subjected to errors induced by the ionosphere. The ionospheric delay affects the speed of microwave signals differently depending on their frequency a characteristic known as dispersion, delays measured on two or more frequency bands can be used to measure dispersion, and this measurement can then be used to estimate the delay at each frequency. The principal source of the dispersion comes from the TEC in the ionosphere, along the line of sight from the Satellite to the receiver. The measurement of the TEC along the line of sight, instead a prediction can be made using a simplified model of the ionosphere is difficult. The signal transmitted from the Satellite to the receiver crosses the ionospheric shell in the so-called IPP. The height is taken as 350km above the earth atmosphere to calculate IPP.

The ionospheric layer will cause slant and vertical delay, due to electron content. Ionosphere delay will affect the speed of microwave signal which causes dispersion in ionosphere. Hence, the electron content in the ionosphere is calculated to find the delay. Therefore, the calculation of IPP is required to find electron content in the ionosphere. The IPP's plays an important role in calculating electron content. To overcome the problems of delay and dispersion IPP calculation is required. The data of 32 Satellites from SP3 file are taken to calculate the azimuth and elevation of the Satellites. To calculate the longitude and latitude of IPP, azimuth and elevation of Satellites are required. Hence, by Plotting longitude versus latitude of IPP, the Plot of IPP can be obtained. Therefore using IPP, the TEC in the ionosphere can be calculated.