ELECTRONIC MEASUREMENT & INSTRUMENTATION
(BEC-29)

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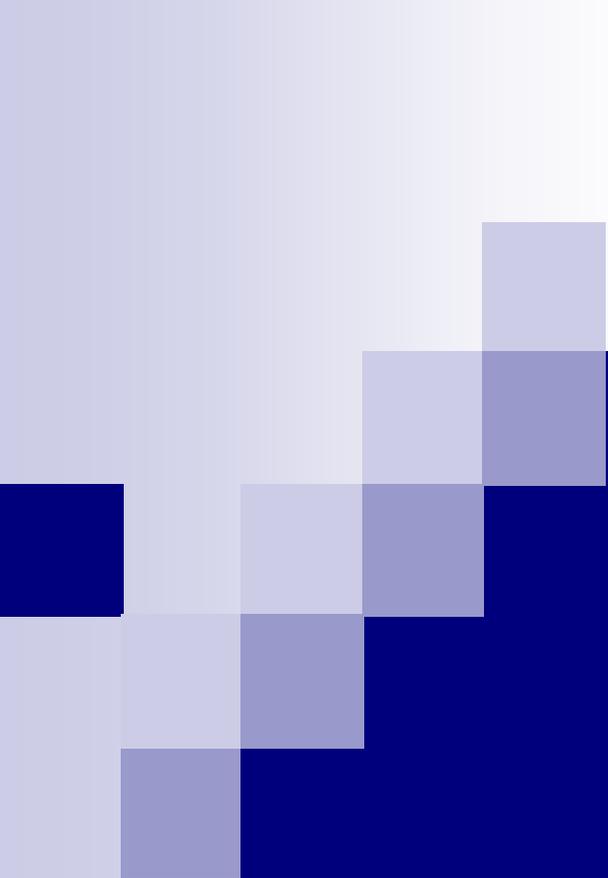
UNIT-III ELECTROMECHENIC ANOLOG TO DIGITAL CONVERTER

Topics

- Introduction

- 3 Binary code wheel

- 3 Binary code wheel showing photosensor

- 3 Bit gray code wheel

INTRODUCTION

- The electromechanical AD Converter is very important, involves the translation of the angular position of a shaft into digital information.

- A very common application of this type of conversion is found in large radar installations, where the azimuth and elevation information are determined directly from the shaft position.

- There are many other examples in aircraft and aerospace fields.

The method is not necessarily limited to rotational information, since rectilinear information can be translated into rotational information by means of a gearing arrangement.

In any case, the job involves changing position information into equivalent digital information.

3 Binary code wheel
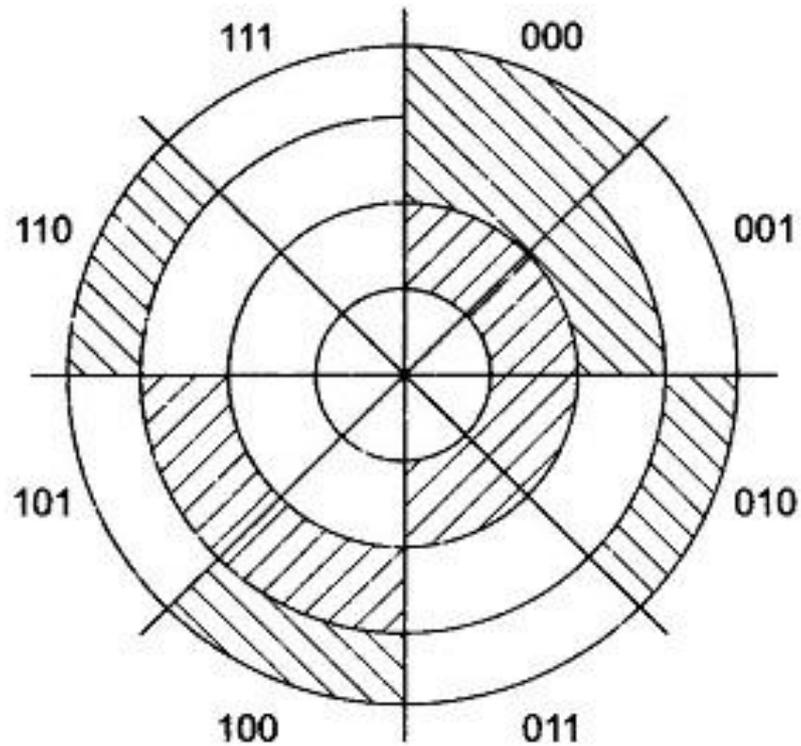
- This wheel is coded in a straight binary fashion and represents 3 bits.

- The wheel is divided into three concentric bands, each representing one bit.

- The innermost band is divided into two equal segments and represents the MSB.

- The middle band is divided into four equal segments and represents the second MSB.

- The outer band has eight equal segments and is the LSB.

Continue…

- If the light areas on the wheel are transparent and the dark areas are opaque, the digital information can be obtained by placing light sources and photo sensors on opposite sides of the disk.

- The output of the sensor is high if light is sensed and low if no light is sensed.

- These outputs then represent I s and Os and can be amplified, passed through logic circuits and used to set F/F. Such system is called an optical encoder.

3 Binary code wheel showing photosensor
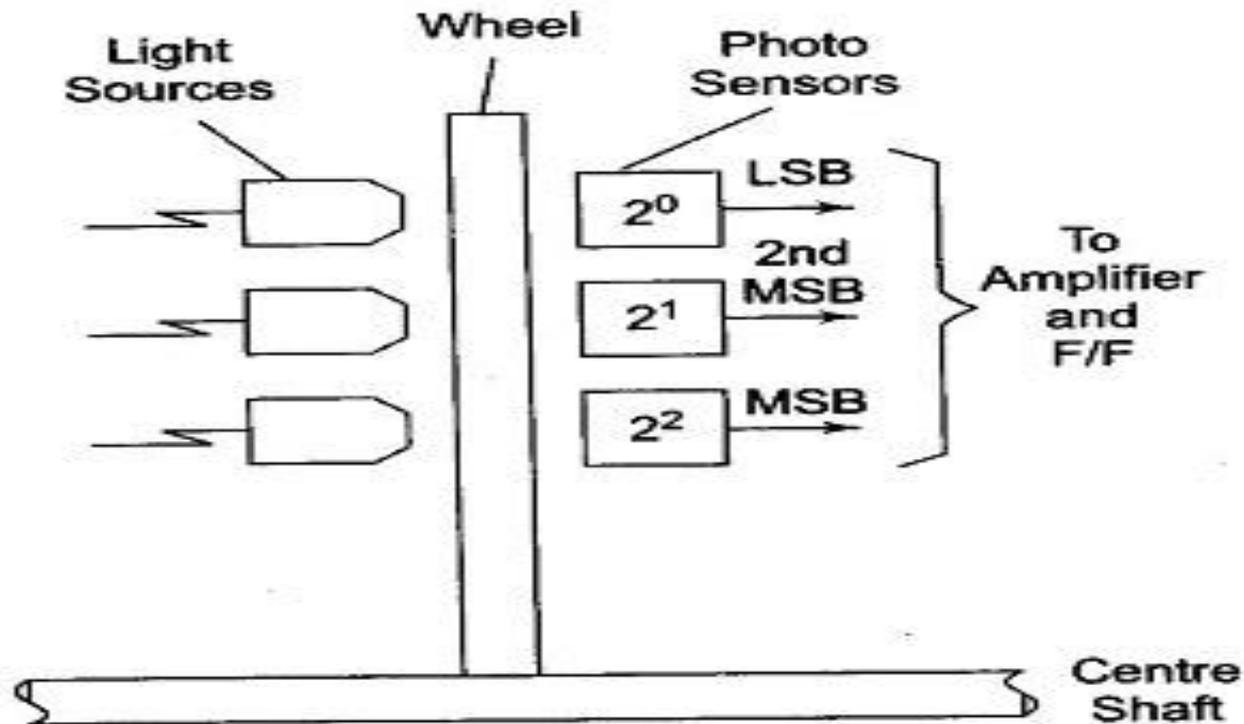
3 Bit gray code wheel
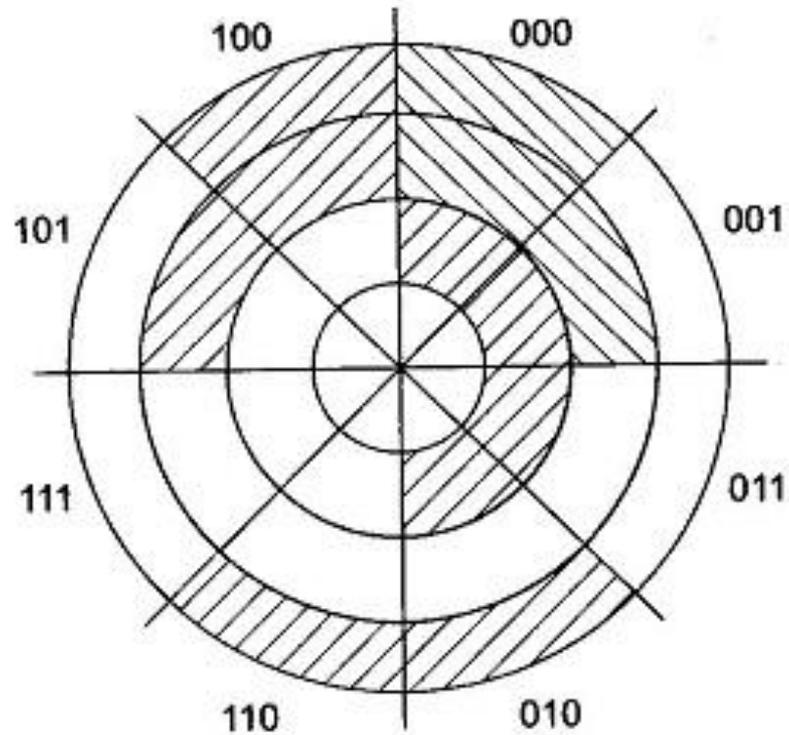
- A code wheel constructed using a Gray code is shown in above slide.
- An examination of the wheel shows that the greatest error caused by a reading ambiguity is one segment of rotation.
- The 3-bit wheel, has the ability to digitise the shaft position into an equivalent 3-bit binary number.
- This implies eight positions around the wheel, each shaft position.
- To obtain a closer reading, it is only necessary to add extra bands to the code wheel and hence extra bands to the code wheel and hence extra bits to the digit number.

- In general, the degree of resolution obtained is given by $360^0/2^n$, where n is the number of bits in the binary number.