

EXPERIMENT NO.7

TITLE: OP-AMP AS DIFFERENTIATOR.**OBJECTIVES:**

1. To assemble the circuit of differentiator using op-amp IC 741.
2. To observe and plot the output voltage waveform of differentiator for sine wave and square wave input.

LAB REQUIREMENTS:

Breadboard, Op-amp IC 741, Resistors (R1/RF), Capacitor(Cf), DC regulated Dual power supply (0-30V), Function Generator, CRO/DSO and connecting wires/Probes.

CIRCUIT DIAGRAM:**Practical Differentiator:****THEORY:**

A circuit in which the output voltage waveform is the derivative of the input voltage waveform is known as differentiator. Such circuit is obtained by using a basic inverting amplifier configuration if the feedback resistor R_1 is replaced by a capacitor C_1 . The output voltage of the integrator circuit is given as-

$$v_o = -R_F C_1 \frac{dv_{in}}{dt}$$

Since differentiator performs the reverse of integrator's function, a cosine wave input will produce a sine wave output or a triangular input will produce a square wave output. However in practical differentiator, resistor R_1 in series with C_1 and capacitor

CF in parallel with R_F may be added to avoid the problem of instability and high frequency noise.

EXPERIMENTAL PROCEDURE:

1. Refer the Pin Diagram of op-amp IC741 & assemble the differentiator circuit as per circuit diagram on the breadboard.
2. Apply V_{CC} & $V_{EE} = \pm 15V$ from DC regulated dual power supply.
3. Now apply AC input sine wave signal of suitable amplitude & frequency from the function generator.
4. Observe the output voltage waveform on oscilloscope.
5. Note down the readings in the observation table.
6. Plot the input & output voltage waveform on graph paper.

OBSERVATION TABLE:

Sr. No.	Input Voltage Amplitude (Vp-p)	Input Voltage Frequency (Hz/KHz)	C1	R1	R_F	Output Voltage Amplitude (Vp-p)
1						
2						

CALCULATIONS:

RESULT:

1. For a sine wave input to an op-amp differentiator produces_____ output.
2. For a square wave input to an op-amp differentiator produces_____ output.

EVALUATION (BY TEACHER):

Excellent/Good/Average/Poor