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9: 05/10/2020

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09S: 10/07/2021

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# Syllabus :

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Unit IV: Bipolar Transistors:  
NPN and PNP transistor (construction and working) CB, CE & CC configurations, loadings, current, input and output characteristics of CE mode, relation between  $\alpha$  and  $\beta$ , Load line and operating point, Amplification action of CE amplifier, biasing and stability, Self and fixed bias circuit.

Unit V : Switching and Optoelectronic devices :  
Construction, working and characteristics of FET, MOSFET, IUT, SCR, Diac & Triac, relation of FET parameters, Construction, working & characteristics of LED, LED, photodiode, photo voltaic cell, Solar cell.

Unit VI: Integrated Circuits:  
Introduction to IC technology, advantages and disadvantages, Classification of ICs, Basic steps in fabrication of monolithic ICs, Fabrication of diode, resistor & transistor. Scale of integration upto VLSI. Basic concept of Embedded systems.

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Semester I  
15-Electronics  
B.Sc. of Electronics

Unit I: Passive Components and Network theorems  
Introduction to Inductors, Capacitors, Inductors and Transformers, Concept of ideal dc voltage and current source, KVL, KCL, Thevenin's, Norton's, maximum power transfer, Millman's theorem (statement, proof, simple numerical application for dc only).

UNIT II: Measuring Instruments :  
Principles of voltmeter, ammeter, ohmmeter, Multirange DC voltmeter, zero per volt rating, loading effect, Multirange DC Ammeter, Series & shunt type ohmmeter, Multimeter (analog & digital) CRO Block diagram & operation, CRT construction & working, uses of CRO (measurement of frequency, amplitude, phase).

Unit III: Semiconductor Diode and Regulated power supply.  
Operation and characteristics of PN junction diode, Avalanche and Zener breakdown mechanism, Half wave and full wave rectifiers (single phase, efficiency, PIV ratings), C, L and  $\pi$  Filters, Concept of unregulated and regulated power supply, Zener diode voltage regulator, Three terminal IC regulator.

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**Books Recommended:**

- 1) Digital and Analog technique by Navneet, Katole and Gokhale
- 2) Element of electronics by Bagde and Singh (S.Chand and Company)
- 3) Principles of electronics by V.K.Mehta
- 4) Introduction to digital electronics by Mohinder Singh
- 5) Electrical and electronics measurement and Instrumentation by A.K. Sawlency
- 6) Text book of Electrical Technology by R.L.Thereja

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**Part B**

(i) The Practical examination of each semester of the B.Sc. (Electronics subject) shall be of 50 marks of 4 hours duration and shall be held at the end of each semester at the places as decided by the university.

(ii) Distribution of 50 marks assigned to practical for (Semester I to V) is as under

1. Experiment	: 30 Marks (Construction, testing and performance)
2. Practical record	: 10 Marks
3. Viva-voce	: 10 Marks
<b>Total</b>	<b>: 50 Marks</b>

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**UNIT - IV : Operational Amplifier (op-amp) and Application**

Difference Amplifier (concept, construction & working), block diagram of Operational Amplifier, characteristics of ideal op-amp, concept of virtual ground, parameter of op-amp( input impedance, output impedance, open loop gain, close loop gain, CMRR, slew rate, input offset voltage and current, input bias current), Application- op-amp as inverting & non-inverting amplifier, Adder, Subtractor, Differentiator & Integrator.

**UNIT - V : Advance application of Op-amp**

Solution to simultaneous equation, differential equation for harmonic, damped harmonic oscillator, regenerative comparator, logarithmic amplifier, Astable, Monostable and Bistable Multivibrator and its Time Period(construction & working).

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**Sant Gadge Baba Amravati University**  
**Syllabus**  
**B.Sc. – Second Year, Semester - III**  
**15. ELECTRONICS**  
**(General Provisions/Instructions)**

**Part A**

(i) The Examination in Electronics of each semester shall comprise of one theory paper of 80 marks of three hours duration and internal assessment of 20 marks.

(ii) Theory paper of each semester shall comprise of six units. Each unit shall be completed in maximum 15 teaching periods of 48 minutes duration.

(iii) There shall be six questions of twelve marks on each unit with alternate choice and One compulsory question (08 sub questions of 01 mark each) of 08 marks covering syllabi of all units (short answer type).

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**UNIT - I - Hybrid Parameter & Cascaded Amplifiers**  
Hybrid Parameters, transistor equivalent circuit of CE, CB, Analysis of small signal CE amplifiers, Concept of Cascaded amplifier, Types of coupling, RC Coupled Amplifier, Single Tuned Amplifier.

**UNIT - II - Power Amplifiers**  
Classification of power amplifier, Class A, Class B, Class C, Class AB amplifier, Class A- transformer coupled amplifier, Class B- push-pull amplifier (construction, working and efficiency of each), Distortion, complementary symmetry Class B push-pull amplifier.

**UNIT - III - Feedback Amplifier and Oscillator**  
Concept of feedback, feedback theory, positive and negative feedback, advantages of negative feedback, physical idea of feedback (Block diagram only), concept of oscillator, basic elements of oscillator, Barkhausen Criteria of oscillator, Concept of Tank Circuit, RC-oscillator, phase shift & Wein Bridge oscillator, LC oscillator: Colpitts & Hartley oscillator, Crystal oscillator.

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**UNIT - VI : A/D and D/A Converter**

Need A/D and D/A Converter,  
D/A Converter: R-2R Ladder type, Weighted resistor, sample and hold circuit, IC ADC, DAC specification.  
A/D Converter: Single and Dual slope, Counter type, Successive approximation type, specification.  
Numerical Base on A/D and D/A Converter.

**Books Recommended:**

- 1) Integrated Electronics by Millman Halkias
- 2) Principle of Electronics by V.K.Mehta
- 3) Element of Electronics by Bagde and Singh
- 4) Linear Integrated Circuit by Ramakant Gaikwad
- 5) Digital principle and application by Malvino and Leach
- 6) Basic Electronics by B.L.Thereja(S Chand and Company)
- 7) Op-amp Theory and Application by Ramakant Gaikwad

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8

**UNIT - VI : A/D and D/A Converter**

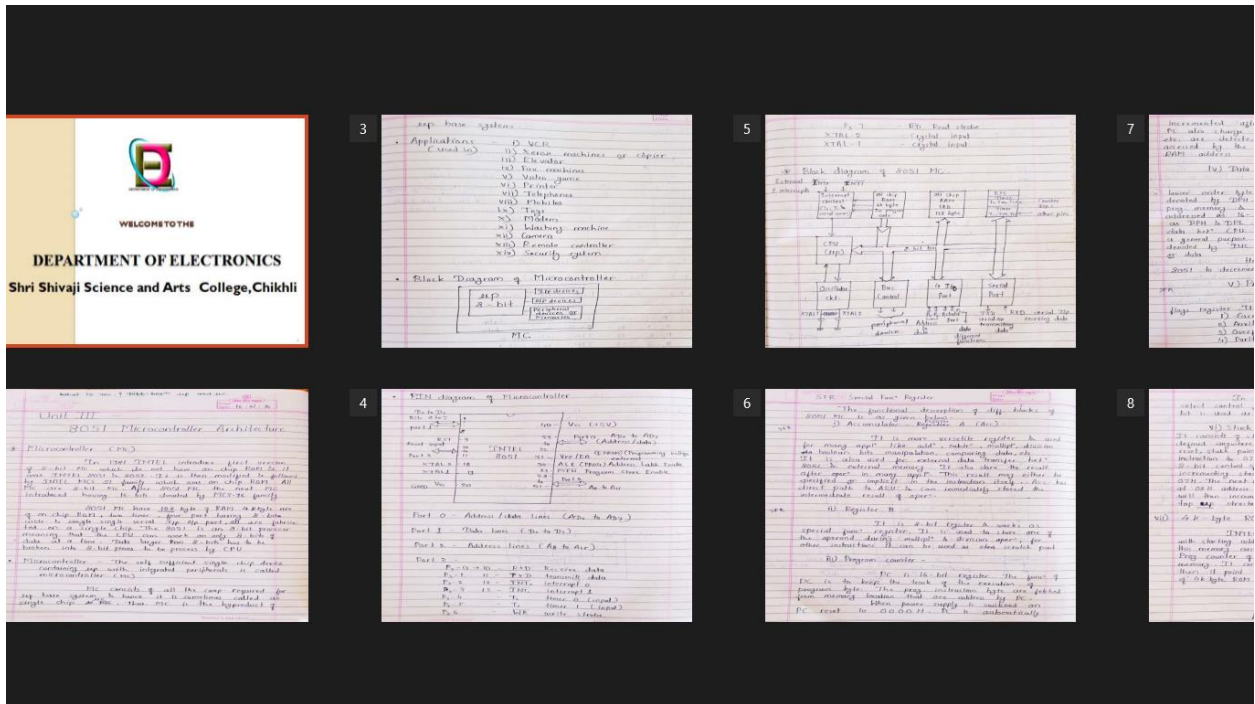
Need A/D and D/A Converter,  
D/A Converter: R-2R Ladder type, Weighted resistor, sample and hold circuit, IC ADC, DAC specification.  
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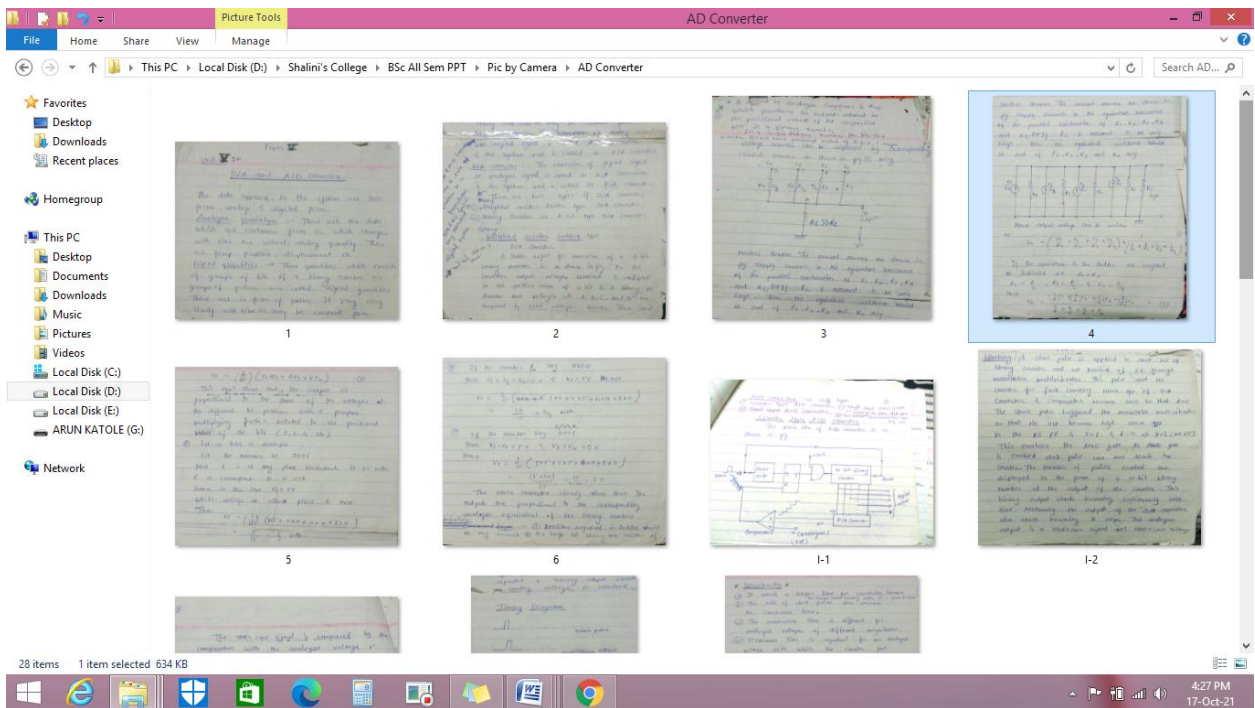
- 1) Integrated Electronics by Millman Halkias
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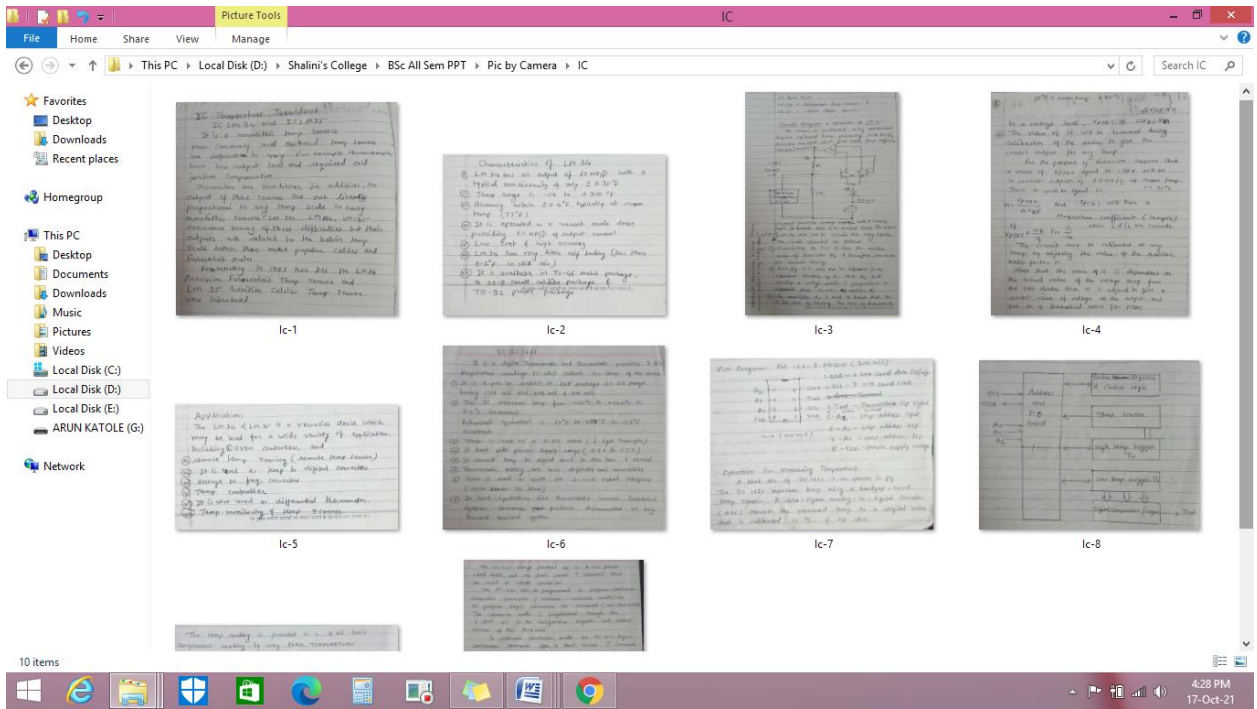
# Notes:



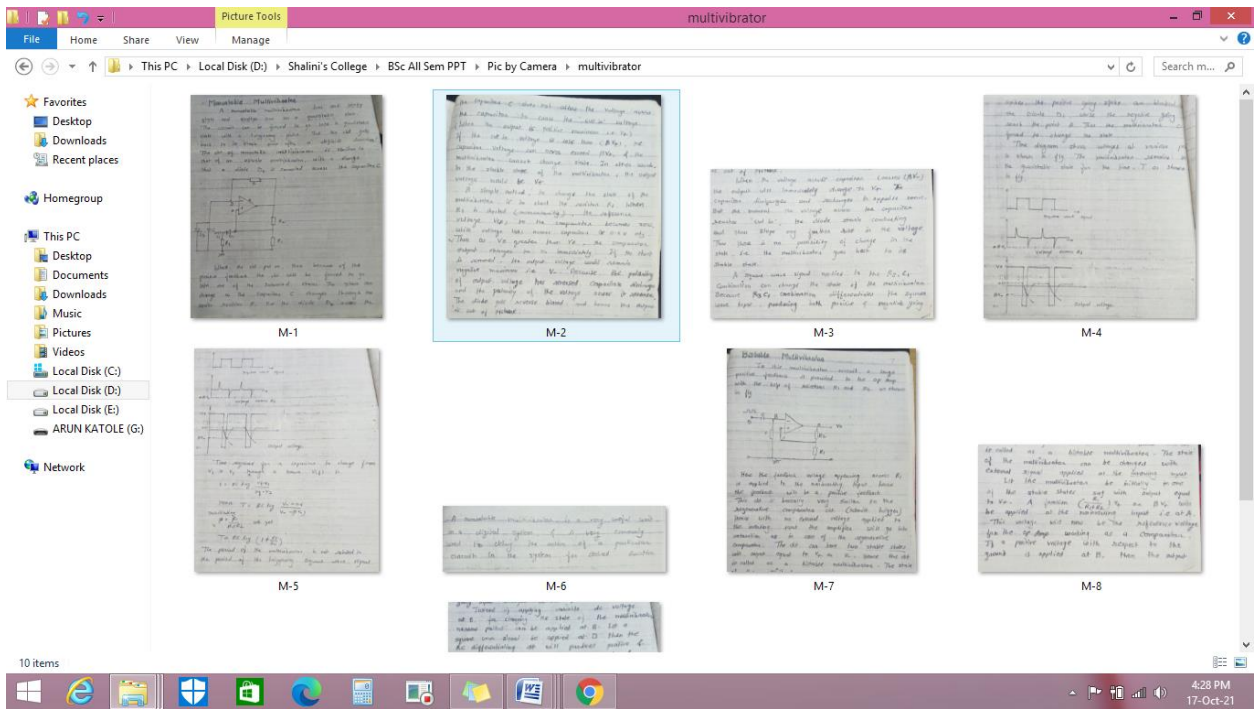
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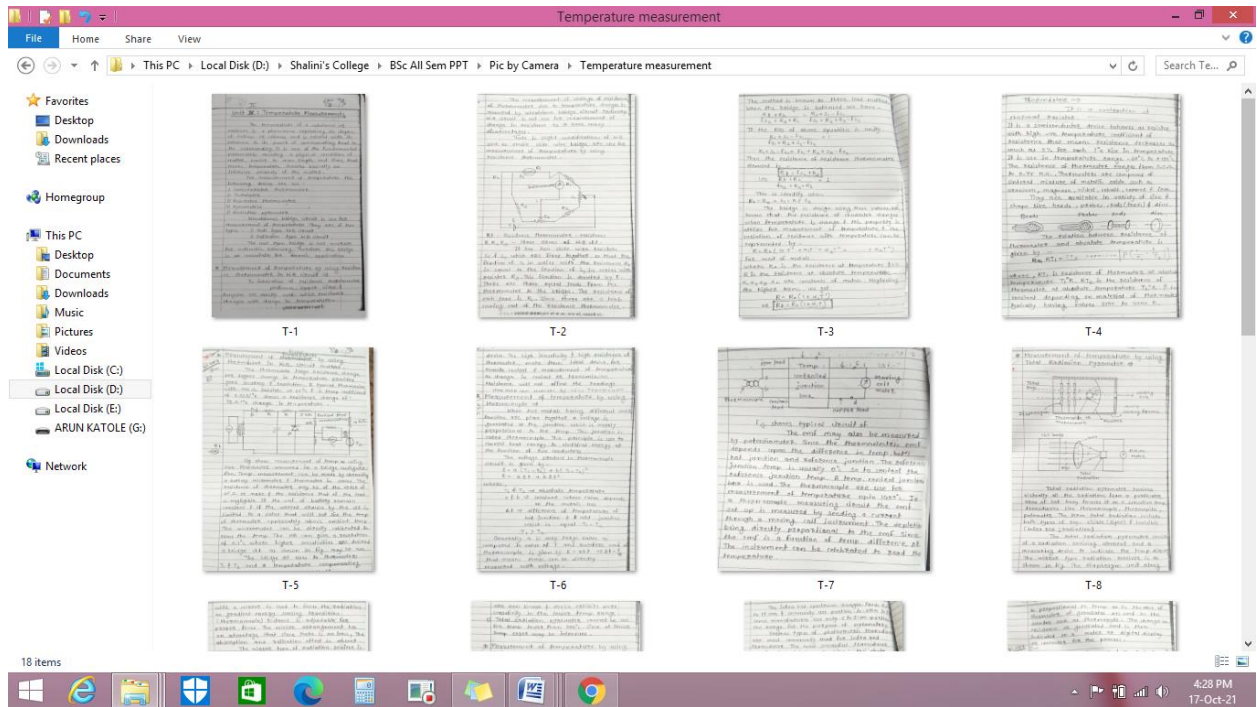
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**PPTs :**

555 TIMER

555 timer- Pin Diagram

The 555 timer is an 8-Pin D.I.P. integrated circuit or 'chip'

555 Timer

**Description:**

- Contains 23 transistors, 2 diodes and 16 resistors
- Maximum operating voltage 16V
- Maximum output current 200mA
- Best treated as a single component with required input and output

If you input certain signals they will be processed / controlled in a certain manner and will produce a known output.

555 timer- Pin Description


Pin	Name	Purpose
1	GND	Ground, low level (0 V)
2	TRIG	OUT rises, and internal starts, when this input falls below 1/3 V <sub>CC</sub> .
3	OUT	This output is driven to approximately 1/2 V below V <sub>CC</sub> or GND.
4	RESET	A timing interval may be reset by stinging this input to GND, but the timing does not begin again until RESET rises above approximately 0.7 volts. Overrides TRIG which overrides TRIG.
5	CTRL	'Control' access to the internal voltage divider (by default, 2/3 V <sub>CC</sub> ).
6	THR	The internal ends when the voltage at THR is greater than at CTRL.
7	DIS	Discharge output; may discharge a capacitor between intervals, in phase with output.
8	V <sub>CC</sub> , V <sub>CC</sub>	Positive supply voltage is usually between 3 and 15 V.

Inside the 555 Timer

Pin	Q	Q	Q
0	0	0	No Change
1	0	1	0
2	1	1	0
3	1	1	X

Fig: Functional Diagram of 555 Timer

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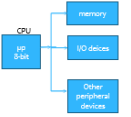


Welcome to the  
**Department of Electronics**  
Shri Shivaji Science and Arts College, Chikhli

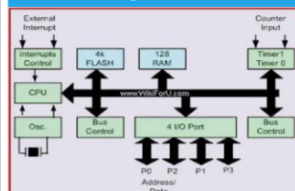
### Block Diagram of Microcontroller

It consists of following parts in single chip.

- 1) 128 byte RAM
- 2) 4 Kbyte ROM
- 3) Two timer
- 4) One serial port
- 5) Four I/O port
- 6) Four flags
- 7) Thirty-four 8-bit register
- 8) Two 16-bit register
- 9) Six interrupt sources
- 10) External ROM, 128 Kbyte



### Block Diagram of mc 8051



### Appl

- Energy Manag
- Touch screens
- Automobiles
- Medical Device

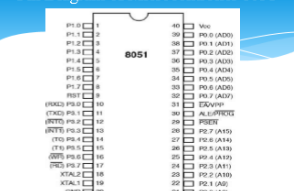
### 8051 Microcontroller

**Definition:**  
The self sufficient single chip device containing microprocessor (µp) with integrated peripherals is called as microcontroller (mc).

**Application of Microcontroller:**

- 1) VCR
- 2) Copier (Xerox)
- 3) Elevator
- 4) Fax machines
- 5) Video Games
- 6) Printer
- 7) Telephone
- 8) Mobile
- 9) Toys
- 10) Washing Machine
- 11) Remote Control
- 12) Camera
- 13) Security system

### Pin Diagram of Microcontroller 8051



### Block diagram of mc 8051 consists of following blocks:

- 1) 8-bit register B (Accumulator)
- 2) 8-bit register D (General Purpose Register-GPR)
- 3) 16-bit PC (Program Counter)
- 4) 16-bit DPTR (Data Pointer)
- 5) 8-bit PSW (Program Status Word)
- 6) 8-bit SP (Stack Pointer)
- 7) 4-Kbyte ROM
- 8) 128-byte RAM
- 9) Four 8-bit I/O ports (P0-P3)
- 10) Two 8-bit timer/counter (T0, T1)
- 11) SBUF - Serial Data Buffer for data transmit
- 12) Control Register
- 13) Two external & Three internal interrupt
- 14) Oscillator & Clock input
- 15) Reset
- 16) External RAM
- 17) ALU
- 18) Timing & Control unit

**Some of the applications of applications are some of it**

- ✓ Light sensing and contr
- ✓ Temperature sensing an
- ✓ Fire detection and safe
- ✓ Automobile application
- ✓ Defense applications

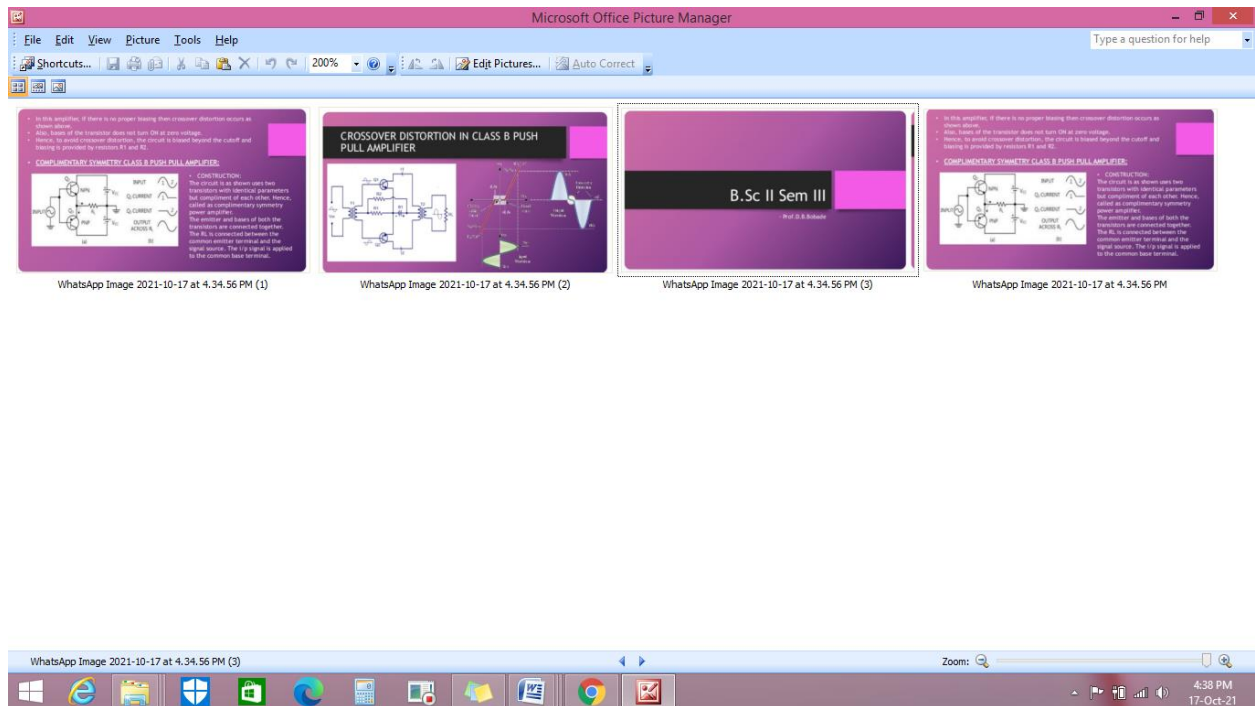
**Some industrial application**

- ✓ Industrial instruments
- ✓ Process control devices

**Some of 8051 microcontro**

- ✓ Voltmeter applications
- ✓ Measuring and revolution
- ✓ Current meter objects
- ✓ Stack held entering sys

(2)



The screenshot shows a window titled "Microsoft Office Picture Manager" with a search bar and a toolbar. Below the toolbar are four image thumbnails:

- WhatsApp Image 2021-10-17 at 4.34.56 PM (1)**: A slide titled "COMPLEMENTARY SYMMETRY CLASS B PUSH PULL AMPLIFIER" with a circuit diagram and text explaining its operation.
- WhatsApp Image 2021-10-17 at 4.34.56 PM (2)**: A slide titled "CROSSOVER DISTORTION IN CLASS B PUSH PULL AMPLIFIER" with a circuit diagram and a graph showing crossover distortion.
- WhatsApp Image 2021-10-17 at 4.34.56 PM (3)**: A slide titled "B.Sc II Sem III" with the name "Prof. B. Babbar" at the bottom.
- WhatsApp Image 2021-10-17 at 4.34.56 PM**: A slide titled "COMPLEMENTARY SYMMETRY CLASS B PUSH PULL AMPLIFIER" with a circuit diagram and text explaining its operation.

At the bottom of the screenshot, the Windows taskbar is visible, showing the system tray with the time "4:38 PM" and date "17-Oct-21".

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## OPERATIONAL AMPLIFIER (OP-AMP)



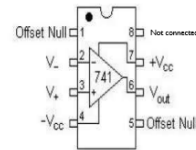
9

- The operational amplifier (op-amp) is a voltage controlled voltage source with very high gain. It is a five terminal four port active element.
- The symbol of the op-amp with the associated terminals and ports is shown on Figures below.



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## Op-amp Pin Configuration



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## Electrical Characteristics of Op-amp

- Voltage gain
- Input Resistance
- Output Resistance
- O/P Voltage when  $V_i = \frac{V_o}{A_{OL}}$
- CMRR =  $\infty$
- Slow Rate =  $C$

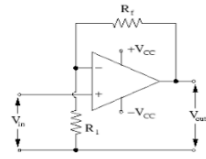
## Op-Amp Introduction

- Op-amps (amplifiers/buffers in general) are drawn as a Triangle in a circuit schematic
- There are two inputs
- Inverting and Non-Inverting
- And one output
- Also power connections (note no explicit ground)



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## Circuit Diagram



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## Characteristics of Idea Op-amp

- Large input impedance (infinite)
- Large open loop gain (infinite)
- Large bandwidth
- Small output impedance
- Large CMRR
- Zero input bias current

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## Parameters of Op-amp

- Input Bias Current  $I_{io}$ : Lesser the input bias current, the better the op-amp.
- Input Offset Current  $I_{io}$ : Smaller the input offset current, the better the op-amp.