Course Code: 23EC0412 R23

UNIT –I
ICS AND OP-AMPS

PART-A (2 MARKS)

1	a)	Define an Integrated Circuit.	[L1] [CO1]	2M
	b)	List classifications of ICs.	[L1] [CO1]	2M
	c)	State two characteristics of an ideal Op-Amp.	[L1] [CO1]	2M
	d)	What is the input impedance of an ideal Op-Amp?	[L1] [CO1]	2M
	e)	Define CMRR	[L1] [CO1]	2M

PART-B (10 MARKS)

2	a)	Write the advantages of Integrated Circuits.	[L1][CO1]	3M
	b)	Explain about the Levels of Integrations.	[L2][CO1]	7M
3	a)	Represent the symbol of IC 741 op-amp and Mention the 8 pins.	[L1][CO1]	3M
	b)	Draw the Symbol of an Op-Amp and Describe about the Op-Amp.	[L2][CO1]	7M
4	a)	Define Inverting Amplifier.	[L1][CO2]	3M
	b)	With the help of IC 741, illustrate the circuit of an inverting amplifier and explain its operation.	[L3][CO2]	7M
5	a)	Define Non-Inverting Amplifier.	[L1][CO1]	3M
	b)	Draw and Explain about the Non-Inverting Amplifier.	[L3][CO2]	7M
6	a)	Write about the Ideal Operational Amplifier.	[L1][CO1]	4M
	b)	Describe about the Differential gain and Common Mode gain.	[L2][CO1]	6M
7	a)	Explain about the Common Mode Rejection Ratio.	[L2][CO2]	4M
	b)	Show the Relationship between CMRR and Output Voltage of an Op-Amp.	[L3][CO2]	6M
8	a)	Illustrate the internal circuit of an operational amplifier	[L2][CO1]	3M
	b)	Illustrate the block diagram of an operational amplifier and discuss the role of its different stages.	[L2][CO1]	7M
9	a)	Write the DC Characteristics of an Op-Amp.	[L1][CO1]	7M
	b)	Write the AC Characteristics of an Op-Amp.	[L1][CO1]	3M
10	a)	Write the Features of an IC741 Op-Amp.	[L1][CO1]	3M
	b)	For an Op-Amp, CMRR & Differential mode gain is 10^5.the output voltage changes by 20V in 4 micro sec.Calculate (i) Common Mode gain (ii) Slew rate	[L3][CO2]	7M
11	a)	Determine the output voltage of a differential Amplifier for the input voltages of 300µV & 240µV.The Differential gain of the amplifier is 5000.the value of the CMRR is 100.	[L4][CO2]	5M
	b)	Determine the output voltage of a differential Amplifier for the input voltages of 400µV & 340µV.The Differential gain of the amplifier is 5000.the value of the CMRR is 100.	[L4][CO2]	5M

UNIT –II
APPLICATIONS OF OP-AMP

PART-A (2 MARKS)

1	a)	What is an inverting amplifier?	[L1][CO2]	2M
	b)	Define a sample and hold circuit.	[L1][CO3]	2M
	c)	Define Virtual Ground Property.	[L1][CO2]	2M
	d)	Define comparator.	[L1][CO3]	2M
	e)	What is a Schmitt Trigger?	[L1][CO3]	2M

PART-B (10 MARKS)

2	a)	Explain the working of an inverting amplifier with Op-Amp and derive its voltage gain equation.	[L3][CO2]	5M
	b)	Express and Explain about the Non-Inverting Amplifier.	[L3][CO2]	5M
3	a)	Using an ideal op-amp, derive the expression for Vout of an inverting adder and describe how the circuit works.	[L3][CO2]	5M
	b)	Show the derivation for the non-inverting summing amplifier and explain the role of each component.	[L3][CO2]	5M
4	a)	Illustrate the inverting subtractor using an op-amp, derive the mathematical expression for Vout and explain its principle.	[L3][CO2]	5M
	b)	With the help of an op-amp, derive the working equation for a non-inverting subtractor circuit and discuss its principle.	[L3][CO2]	5M
5	a	Explain the working of an instrumentation amplifier using its circuit diagram	[L2][CO2]	5M
	b)	Using the standard three-op-amp configuration, derive the gain formula of an instrumentation amplifier.	[L3][CO2]	5M
6	a)	With the help of a neat diagram, derive and explain the operation of an inverting AC amplifier.	[L3][CO2]	5M
	b)	Derive the mathematical expression for the voltage gain of a non-inverting AC amplifier and explain.	[L3][CO2]	5M
7	a)	Illustrate the circuit of an op-amp based V–I converter and describe how it converts an input voltage into a proportional current.	[L3][CO2]	5M
	b)	With a neat diagram, explain the working principle of an I–V converter and derive the output voltage expression.	[L3][CO2]	5M
8	a)	Obtain the expression for the transfer function of an inverting integrator circuit using an op-amp.	[L3][CO2]	5M
	b)	Illustrate the Expression of Differentiator Circuit.	[L3][CO2]	5M
9	a)	Describe the principle of a sample and hold circuit with the help of a neat circuit diagram.	[L2][CO3]	5M
	b)	How logarithmic and antilogarithmic amplifiers are implemented using op-amps? Draw and explain their circuits.	[L3][CO3]	5M
10	a)	Draw the schematic of an inverting comparator and explain its function with input-output waveforms.	[L3][CO3]	5M
	b)	Discuss about Schmitt trigger with neat circuit diagram and waveforms.	[L3][CO3]	5M
11	a)	Differentiate between Comparator and Schmitt Trigger.	[L2][CO3]	6M
	b)	Design an Adder Circuit using an Op-Amp to get the output voltage expression as $V_0=-(0.1V_1 +V_2+10V_3)$	[L6][CO2]	4M

UNIT –III
ACTIVE FILTERS AND OTHER ICS
PART-A (2 MARKS)

1	a)	Define filter?	[L1][CO4]	2M
	b)	Define cut-off frequency.	[L1][CO4]	2M
	c)	List applications of 555 timer.	[L1][CO4]	2M
	d)	Define PLL?	[L1][CO4]	2M
	e)	Write the function of a phase detector.	[L1][CO4]	2M

PART-B (10 MARKS)

2	a)	Explain about the Low Pass Filter.	[L2][CO4]	4M
	b)	Design a 1st Order Low Pass Butterworth Filter using an Op-Amp with Expressions.	[L3][CO4]	6M
3	a)	Explain about the High Pass Filter.	[L2][CO4]	4M
	b)	Design a 1st Order High Pass Butterworth Filter using an Op-Amp with Expressions.	[L3][CO4]	6M
4	a)	Draw and Explain about the Band Pass Filter.	[L2][CO4]	5M
	b)	Draw and Explain about the Band Rejection Filter.	[L2][CO4]	5M
5	a)	Design a 2nd Order Low Pass Butterworth Filter using an Op-Amp with Expressions.	[L3][CO4]	6M
	b)	Derive and Explain about the All Pass Filter.	[L3][CO4]	4M
6	a)	Discuss about the Pin Diagram of IC555 Timer.	[L2][CO4]	4M
	b)	Explain about the Functional description of IC555 Timer.	[L2][CO4]	6M
7	a)	Explain the working of a monostable multivibrator using IC 555 with a neat circuit diagram and waveforms.	[L2][CO4]	5M
	b)	Describe the operation of an astable multivibrator using IC 555 timer with the help of a circuit diagram.	[L2][CO4]	5M
8	a)	Illustrate the circuit of a Schmitt Trigger using IC 555 and explain its principle with transfer characteristics.	[L2][CO4]	5M
	b)	Draw and explain the block diagram of the monolithic IC 565 (PLL).	[L2][CO4]	5M
9	a)	With a neat block schematic, explain the functional operation of a Phase Locked Loop (PLL)	[L2][CO4]	6M
	b)	Define PLL and List the applications of PLL.	[L1][CO4]	4M
10	a)	Design a Low pass filter at a cutoff frequency of 10KHZ with a passband gain of 2.	[L3][CO4]	5M
	b)	Design a wideband pass filter having f_L=400HZ f_H=2KHZ pass band gain of 4.Draw the frequency response of the filter and calculate the Q Value of the filter.	[L4][CO4]	5M
11	a)	For the All pass filters, the values of R & C are 7.5KΩ and 0.02μF respectively. if the input frequency is 1.5KHZ calculate the Phase shift.	[L3][CO4]	7M
	b)	Design a Notch filter to eliminate 120HZ hum.	[L6][CO4]	3M

UNIT –IV
<u>VOLTAGE REGULARS AND CONVERTERS</u>
<u>PART-A (2 MARKS)</u>

1	a)	What is a voltage regulator?	[L1][CO5]	2M
	b)	Define ADC.	[L1] [CO5]	2M
	c)	Define DAC.	[L1] [CO5]	2M
	d)	Define Switching Regulator?	[L1] [CO5]	2M
	e)	Write the Types of ADC and DAC techniques.	[L1] [CO5]	2M

<u>PART-B (10 MARKS)</u>

2	a)	Draw and Explain about the Series Op-Amp Regulator.	[L3][CO5]	5M
	b)	Explain about the Voltage Regulators.	[L2][CO5]	5M
3	a)	Explain about the Switching Regulator.	[L2][CO5]	7M
	b)	Write the Applications of Voltage Regulators.	[L1][CO5]	3M
4	a)	Explain the basic structure of DAC.	[L2][CO5]	5M
	b)	Draw and explain the weighted resistor DAC.	[L3][CO5]	5M
5	a)	Draw and explain the operation of R-2R DAC.	[L3][CO5]	8M
	b)	List the types of ADC.	[L1][CO5]	2M
6	a)	Explain about parallel comparator ADC with neat block diagram.	[L2][CO5]	5M
	b)	Explain about counter type ADC with neat block diagram.	[L2][CO5]	5M
7	a)	The basic step of a 9-bit DAC is 10.3 mV. If "000000000" represents 0V. What output is produced if the input is "101101111"?	[L3][CO5]	3M
	b)	Explain about flash type ADC.	[L2][CO5]	7M
8	a)	Draw and explain successive approximation type ADC with an Example.	[L3][CO5]	5M
	b)	Draw the circuit diagram of Dual Slope ADC and explain its working with neat sketch.	[L3][CO5]	5M
9	a)	What output voltage would be produced by a D/A Converter whose output range is o to 10V & whose input binary no. is (i)10 (2 bit DAC) (ii) 0110 (4 bit DAC (iii) 10111100 (8 bit DAC)	[L3][CO5]	6M
	b)	Calculate the values of LSB and MSB and full scale output for an 8 bit DAC for the 0 to 10V range.	[L3][CO5]	4M
10	a)	An 8-bit DAC has an output voltage range of (0-2.55V) Define its Resolution in two ways.	[L3][CO5]	4M
	b)	The digital input for a 4-bit DAC is 0110.Calucate its final output voltage given V_{OFS}=15V.	[L3][CO5]	6M
11	a)	For a Dual slope ADC V_R=100mv t_1=50msec and clock frequency is 12KHZ find the digital output for an input voltage of 200mv.	[L4][CO5]	5M
	b)	An 8-bit has resolution of 20mv/LSB. find its V_{OFS} and V_O if the input is $(10000000)_2$	[L4][CO5]	5M

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UNIT –V
DIGITAL ICS

PART-A (2 MARKS)

1	a)	Define CMOS.	[L1][CO6]	2M
	b)	Define PMOS	[L1][CO6]	2M
	c)	Define NMOS	[L1][CO6]	2M
	d)	Define Encoder	[L1][CO6]	2M
	e)	Define Flipflop	[L1][CO6]	2M

PART-B (10 MARKS)

2	a)	Explain about the CMOS Logic Levels.	[L2][CO6]	5M
	b)	Draw and Explain about the PMOS Transistors.	[L3][CO6]	5M
3	a)	Draw and Explain about the NMOS Transistors.	[L3][CO6]	5M
	b)	Draw and Explain about the Basic CMOS Inverter.	[L3][CO6]	5M
4	a)	Design the NAND gate using CMOS Logic	[L3][CO6]	5M
	b)	Design the NOR gate Using CMOS Logic.	[L3][CO6]	5M
5	a)	Design and Explain about the CMOS AND-OR-INVERT	[L1][CO6]	5M
	b)	Design and Explain about the CMOS OR-AND-INVERT	[L1][CO6]	5M
6	a)	Write the Applications of TTL-74XX & CMOS 40XX Series ICs	[L2][CO6]	5M
	b)	Write the Specifications of TTL-74XX & CMOS 40XX Series ICs	[L2][CO6]	5M
7	a)	Define Decoder and Explain any one of the Decoder with truth table.	[L3][CO6]	5M
	b)	Define Encoder and Explain about any one of the Encoder with truth table	[L2][CO6]	5M
8	a)	Draw and Explain about the Priority Encoder.	[L2][CO6]	5M
	b)	Define Multiplexer and Explain any one of the Multiplexer with truth table.	[L1][CO6]	5M
9	a)	Define De-Multiplexer and Explain any one of the De-Multiplexer with truth table.	[L3][CO6]	5M
	b)	Define Flip-Flop and Write the types of Flip-Flops.	[L3][CO6]	5M
10	a)	Draw and Explain about the JK Flip-Flop.	[L2][CO6]	5M
	b)	Draw and Explain about the SR Flip-Flop.	[L2][CO6]	5M
11	a)	Explain about the Counters.	[L2][CO6]	5M
	b)	Explain about the Shift Registers,	[L2][CO6]	5M

UNIT –I
ICS AND OP-AMPS

1. What is an Integrated Circuit (IC)   [   ]
   A) power cable   B) A small chip with many electronic components   C) A software tool   D) A motor

2. What does IC classification depend on   [   ]
   A) Color of the chip   B) Voltage rating only   C) Physical size   D) No. of components & usage

3. What is the most used Op-Amp IC   [   ]
   A) IC 555   B) IC 741   C) IC 7805   D) IC 4001

4. What is the function of an operational amplifier   [   ]
   A) Convert AC to DC   B) Generate power   C) Store data   D) Amplify electrical signals

5. What is the ideal input impedance of an Op-Amp   [   ]
   A) 0 ohms   B) 100 ohms   C) 10 ohms   D) Infinite

6. What is the ideal output impedance of an Op-Amp   [   ]
   A) 1000 ohms   B) 1 ohm   C) Zero   D) Infinite

7. What is the typical open-loop gain of an ideal Op-Amp   [   ]
   A) 1   B) 10   C) Infinite   D) 100

8. How many terminals does IC 741 have   [   ]
   A) 6   B)10   C)4   D)8

9. What is the purpose of the inverting input   [   ]
   A) Reverses the phase of input signal   B) Adds power   C) Filters signals   D) Multiplies signals

10. What is the power supply range of IC 741   [   ]
    A) ±1V   B) 0V to 5V   C) ±5V to ±18V   D) 50V to 100V

11. Which pin is used for offset null in IC 741   [   ]
    A) Pin 2   B) Pin 1 and Pin 5   C) Pin 3   D) Pin 4

12. What is circuit complexity in ICs   [   ]
    A) No. of components in the IC   B) Shape of circuit   C) Color of IC   D) Material used

13. What is the use of the output pin in Op-Amp   [   ]
    A) Power the IC   B) Adjust input   C) Start oscillation   D) Give the amplified signal

14. What is the role of feedback in Op-Amps   [   ]
    A) Increases noise   B) Decreases speed   C) Controls gain and stability   D) Heats the circuit

15. What is a differential input   [   ]
    A) Difference between two input voltages   B) Sum of two inputs   C) Input with same voltage   D) Input of power supply

16. What is CMRR in Op-Amps   [   ]
    A) Gain at output   B) Power used   C) Ability to reject common signals   D) Input current

17. Which of these is NOT a DC characteristic of Op-Amp   [   ]
    A) Frequency response   B) Input bias current   C) Offset voltage   D) Input offset current

18. Which one is an AC characteristic of Op-Amp   [   ]
    A) Offset voltage   B) Input impedance   C) O/P impedance   D) Slew rate

19. What does "slew rate" mean   [   ]
    A) Input voltage   B) Offset current   C) Rate of change of output voltage   D) Bias voltage

20. What is the use of an offset null   [   ]
    A) Supply power   B) Increase gain   C) Start oscillation   D) Remove unwanted output when input is zero

21. Which IC package is used for 741 Op-Amp   [   ]
   A) BGA   B) QFP   C) TO-92   D) DIP
   (Dual Inline Package)

22. What is the function of the non-inverting input   [   ]
   A) Reverse phase   B) Keep same phase of input signal   C) Ground the signal   D) Act as output

23. Op-Amps are generally used with which feedback   [   ]
   A) No feedback   B) Negative feedback   C) Positive feedback   D) Mixed feedback

24. What is the unit of gain in Op-Amps   [   ]
   A) Amps   B) Volts   C) Decibels (dB)   D) Ohms

25. Which pin in IC 741 is for +Vcc supply   [   ]
   A) Pin 1   B) Pin 4   C) Pin 7   D) Pin 8

26. What does a high input impedance mean   [   ]
   A) Op-Amp takes very little current from input   B) Takes more power   C) Voltage becomes high   D) Output is blocked

27. How is IC chip size generally measured   [   ]
   A) In kilograms   B) In millimeters or micrometers   C) In liters   D) In volts

28. Which factor increases circuit complexity   [   ]
   A) Size of IC   B) Shape of IC   C) Number of transistors and resistors   D) Color of IC

29. Which property is true for ideal Op-Amps   [   ]
   A) Low gain   B) High output impedance   C) Infinite input impedance   D) Low bandwidth

30. What happens if both Op-Amp inputs are equal   [   ]
   A) Output is zero   B) Output is max   C) Output is noisy   D) Output is negative

31. What is PSRR in Op-Amps   [   ]
   A) Output noise   B) Phase shift   C) Peak signal ratio   D) Power Supply Rejection Ratio

32. Which component is not inside Op-Amp internal circuit   [   ]
   A) Transistors   B) Resistors   C) Capacitors   D) Inductors

33. How many stages are in Op-Amp internal circuit   [   ]
   A)1   B)2   C)5   D)3

34. What does the gain of an Op-Amp depend on   [   ]
   A) Size of the chip   B) Feedback and circuit design   C) Color of IC   D) Shape of package

35. What does output voltage swing mean   [   ]
   A) Oscillation time   B) Pin number   C) Circuit error   D) Max. voltage Op-Amp can output

36. Why is IC 741 called general purpose Op-Amp   [   ]
   A) It is used in many common applications   B) It is very costly   C) It is programmable   D) It has no feedback

37. Which pin in IC 741 is used for -Vcc   [   ]
   A) Pin 7   B) Pin 4   C) Pin 2   D) Pin 1

38. Which configuration gives highest gain   [   ]
   A) Unity gain   B) Non-inverting   C) Open-loop   D) Inverting

39. Which signal does an Op-Amp amplify   [   ]
   A) Power signal   B) Difference between two inputs   C) Supply voltage   D) Clock pulse

40. Why is IC packaging important   [   ]
   A) It protects the chip and allows connection   B) It makes IC colorful   C) It changes voltage   D) It controls temperature

UNIT –II
<u>APPLICATIONS OF OP-AMP</u>

1. In an inverting amplifier, the input is applied to the------ terminal.   [   ]
   A) Non-inverting   B)   Inverting   C) Output   D) Offset
2. In a non-inverting amplifier, the output is in---- phase with input.   [   ]
   A) Opposite   B) Lagging   C) Same   D) Shifted
3. A differential amplifier amplifies the---- between two signals.   [   ]
   A) Sum   B) Difference   C) Product   D) Average
4. An Op-Amp adder combines multiple---- signals.   [   ]
   A) Digital   B) AC   C) Constant   D) Input voltage
5. An Op-Amp subtractor gives the---- of two inputs.   [   ]
   A) Sum   B) Difference   C) Average   D) None
6. . Instrumentation amplifiers are known for high-------   [   ]
   A) Power output   B) Accuracy and gain   C) Noise   D) Temperature
7. An AC amplifier can block ------ signals.   [   ]
   A)AC   B)DC   C)RF   D) Modulated
8. A V to I converter converts voltage into   [   ]
   A) Power   B) Resistance   C) Current   D) Frequency
9. A current-to-voltage converter is used in----- devices.   [   ]
   A) Digital clocks   B) Photodiodes   C) Motor controllers D) Transmitters
10. An Op-Amp integrator gives ----------of input.   [   ]
    A) Time integral   B) Derivative   C) Constant   D) Pulse
11. . A log amplifier uses the -----------behavior of diodes   [   ]
    A) Linear   B) Constant   C) Logarithmic   D) None
12. Differentiator gives the ------- of input.   [   ]
    A) Integral   B) Average   C) Frequency   D) Rate of change
13. Sample and hold circuits are used in ------- systems.   [   ]
    A) Oscillators   B) Motors   C) ADC   D) AM Radios
14. Antilog amplifiers perform ---------- operations.   [   ]
    A) Subtraction   B) Exponential   C) Frequency   D) Noise removal
15. Op-Amp multipliers multiply two --------signals.   [   ]
    A) Digital   B) Output   C) Clock   D) Analog
16. Comparators compare two voltages and give a --------- output.   [   ]
    A) Sine wave   B) Triangular   C) Binary   D) Random
17. A Schmitt trigger provides -----------switching.   [   ]
    A) Slow   B) Noise-free and   C) Linear   D) None
                              stable
18. Astable multivibrator produces ---------output.   [   ]
    A) Stable DC   B) Pulse once   C) Constant voltage D) Continuous square
                                                                           wave
19. Monostable multivibrator gives----------output for one trigger.   [   ]
    A) Continuous   B) Single pulse   C) Oscillating   D) Inverted
20. Bistable multivibrator has ------- stable states.   [   ]
    A) 1   B)3   C)2   D)4
21. Triangle wave generator gives a -------- output shape.   [   ]
    A) Square   B) Linear ramp up and   C) Sawtooth   D) Sinusoidal
                              down
22. Square wave generators give ------- output.   [   ]
    A) Smooth   B) Sine   C) Modulated   D) High and low
                                                                           levels
23. Wein Bridge oscillator uses Op-Amps to generate ----------waves.   [   ]
    A) Square   B) Sine   C) Triangular   D) Sawtooth

24. Phase shift oscillators generate ------- waves with Op-Amps   [   ]
    A) DC   B) Pulse   C) Sine   D) No

25. Which amplifier configuration gives phase inversion   [   ]
    A) Non-inverting   B) Inverting   C) Voltage follower   D) None

26. Which amplifier has gain = 1   [   ]
    A) Inverting   B) Differential   C) Subtractor   D) Voltage follower (buffer)

27. Which Op-Amp circuit combines signals   [   ]
    A) Integrator   B) Comparator   C) adder   D) Schmitt trigger

28. Which application removes a DC level from the input signal   [   ]
    A) Adder   B) AC amplifier   C) Subtractor   D) Log amplifier

29. Which circuit is used to store input voltage briefly   [   ]
    A) Differentiator   B) Integrator   C) Sample and hold   D) Comparator

30. What is the function of a comparator   [   ]
    A) Subtract voltages   B) Add signals   C) Multiply inputs   D) Compare voltages and give digital O/P

31. What does a Schmitt trigger help eliminate   [   ]
    A) DC   B) AC   C) Gain   D) Noise in signals

32. What is the output of a differentiator   [   ]
    A) Constant   B) Rate of change   C) Sine wave   D) Amplified signal

33. What is the output of an integrator   [   ]
    A) Derivative   B) Inverted input   C) Cumulative sum over time   D) No output

34. Op-Amp-based oscillators work without any -------- signal.   [   ]
    A) Voltage   B) Gain   C) Input   D) Output

35. Triangular wave output is generated by combining which circuits   [   ]
    A) Differentiator only   B) Comparator   C) Subtractor   D) Integrator and square wave generator

36. Which circuit is best for analog multiplication   [   ]
    A) Adder   B) Multiplier using Op-Amp   C) Differentiator   D) Voltage follower

37. Which waveform is symmetrical and used in testing   [   ]
    A) Sine   B) Square   C) Sawtooth   D) DC

38. Which application is important in ADCs using Op-Amps   [   ]
    A) Oscillator   B) Sample and hold   C) Schmitt trigger   D) Adder

39. Which amplifier rejects common signals and amplifies difference   [   ]
    A) Non-inverting   B) Adder   C) Differential amplifier   D) Comparator

40 Why is IC packaging important   [   ]
    A) Protects the chip & allows connection   B) It makes IC colorful   C) It changes voltage   D) It controls temperature

UNIT –III
ACTIVE FILTERS AND OTHER ICS

1. Butterworth filters are designed for --------response.   [   ]
   A) Sharp   B) Flat   C) Uneven   D) Rippled

2. A first-order low-pass filter allows ------- frequencies to pass   [   ]
   A) High   B) Mid   C) Low   D) None

3. A second-order high-pass filter attenuates ------ frequencies more.   [   ]
   A) Low   B) High   C) All   D) None

4. Band-pass filters allow a ----------range of frequencies.   [   ]
   A) Very low   B) Specific   C) All   D) None

5. A band-reject filter blocks ---------- frequencies.   [   ]
   A) Low   B) High   C) Certain   D) All

6. An all-pass filter passes all frequencies with -------- change.   [   ]
   A) Gain   B) Phase   C) Frequency   D) Resistance

7. The cut-off frequency of a filter is the point where gain drops by ---------- dB.   [   ]
   A) 0   B) 3   C)6   D)10

8. The IC 555 is commonly used as a-------   [   ]
   A) Comparator   B) Filter   C) Amplifier   D) Timer

9. In the IC 555 timer, pin 3 is the -------- pin.   [   ]
   A) Trigger   B) Reset   C) Output   D) Control

10. Pin 2 of IC 555 is the ---------input.   [   ]
    A) Discharge   B) Trigger   C) Output   D) Vcc

11. . In astable mode, IC 555 continuously produces a --------waveform.   [   ]
    A) Sine   B) Square   C) Triangular   D) DC

12. In monostable mode, the IC 555 gives ------- output pulse(s) per trigger.   [   ]
    A) Continuous   B) One   C) Two   D) Infinite

13. Which components decide the timing interval in a 555 timer   [   ]
    A) Transistors   B) Inductors   C) Diodes   D) Resistors and capacitors

14. The IC 555 works with voltages from -------- volts.   [   ]
    A) 1–3V   B) 3–6V   C) 4.5–15V   D) 20–25V

15. What is the function of the discharge pin in IC 555   [   ]
    A) Output   B) Discharges capacitor   C) Inverts signal   D) Controls voltage

16. A Schmitt trigger using Op-Amp introduces------   [   ]
    A) Hysteresis   B) Filtering   C) Delay   D) Gain

17. A Phase-Locked Loop (PLL) is used to lock onto the --------- of a signal.   [   ]
    A) Power   B) Shape   C) Frequency   D) Voltage

18. The heart of a PLL is the------   [   ]
    A) Filter   B) Timer   C) Comparator   D) Phase detector & VCO

19. The IC 566 is a------   [   ]
    A) Timer   B) VCO   C) Counter   D) Amplifier

20. What is the use of the low-pass filter in a PLL   [   ]
    A) Increases voltage   B) Stores data   C) Acts as an amplifier   D) Removes high-frequency components

21. The output frequency of a VCO depends on-----   [   ]
    A) Input voltage   B) Input current   C) Control voltage   D) Clock signal

22. A monolithic PLL is a PLL built into a----   [   ]
    A) Transistor   B) Capacitor   C) Single IC   D) Transformer

23. The function of a phase detector in PLL is to compare------   [   ]
    A) Voltages   B) Input and feedback   C) Currents   D) Powers
                              frequencies
24. A basic PLL has how many blocks   [   ]
    A) 2   B) 4   C) 3   D) 5
25. In filters, the roll-off rate of a second-order filter is --------- dB/decade.   [   ]
    A) 10   B) 40   C) 20   D) 60
26. The Butterworth filter provides -------in the passband.   [   ]
    A) Peaks   B) Flat response   C) Ripple   D) No gain
27. An astable 555 timer has no ------ state.   [   ]
    A) Stable   B) High   C) Low   D) Output
28. In monostable mode, output returns to low after-------   [   ]
    A) Time period   B) Triggering   C) Reset   D) Delay
29. The duty cycle of a 555 astable circuit depends on----   [   ]
    A) Load   B) Vcc   C) R1, R2, and C   D) Pin 1
30. A filter that passes high and low frequencies but blocks mid-range is called----   [   ]
    A) Low-pass   B) Band-stop (Notch)   C) Band-pass   D) All-pass
31. What does a control voltage do in a VCO   [   ]
    A) Sets amplitude   B) Starts oscillator   C) Changes output   D) Controls duty cycle
                                                       frequency
32. PLLs are commonly used in ------systems.   [   ]
    A) Power supply   B) Audio systems   C) Communication   D) Motors
33. The frequency of an IC 566 VCO is set by-----   [   ]
    A) Inductance   B) Resistor and   C) Input power   D) Output load
                              capacitor
34. In a 555 timer, reset pin (pin 4) is used to-----   [   ]
    A) Disable the timer   B) Set frequency   C) Start VCO   D) Connect to Vcc
35. A band-pass filter is formed by combining-----   [   ]
    A) Two low-pass   B) Low-pass and   C) High-pass filters D) Schmitt triggers
    filters   high-pass filters   only
36. The unit for phase in a PLL is-----   [   ]
    A) Hz   B) Degrees or radians   C) Amps   D) Volts
37. Which IC is used for generating accurate timing pulses   [   ]
    A) 723   B) 741   C) 555   D) 4017
38. The VCO in a PLL controls the ---------- of output signal.   [   ]
    A) Power   B) Amplitude   C) Frequency   D) Duty
39. Filters are classified by their ------- characteristics.   [   ]
    A) Frequency   B) Voltage   C) Current   D) Size
40. The main use of filters in electronics is to-----   [   ]
    A) Reduce size   B) Change voltage   C) Store energy   D) Pass or block
                                                                            specific frequencies

UNIT –IV
VOLTAGE REGULARS AND CONVERTERS

1. What does a voltage regulator do   [   ]
   A) Increases current   B) Keeps output voltage constant   C) Controls resistance   D) Amplifies signal

2. A series Op-Amp regulator uses a --------- element in series.   [   ]
   A) Capacitor   B) Resistor   C) Pass transistor   D) LED

3. IC 723 is a --------voltage regulator.   [   ]
   A) Fixed   B) General purpose   C) Switching   D) AC

4. Which IC provides positive fixed voltage   [   ]
   A) 7912   B) 723   C) 555   D) 7812

5. What is the output of a 7805 regulator   [   ]
   A) 3.3V   B) 5V   C) 9V   D) 12V

6. Switching regulators use -----to control voltage   [   ]
   A) Resistors   B) Diodes only   C) High-speed switching elements   D) Capacitors only

7. A buck converter ------ the voltage.   [   ]
   A) Increases   B) Decreases   C) Inverts   D) Blocks

8. A boost converter ------- the voltage.   [   ]
   A) Reduces   B) Maintains   C) Increases   D) Discharges

9. In a switching regulator, efficiency is usually above -------   [   ]
   A) 30%   B) 50%   C) 100%   D) 70–90%

10. A DAC converts-----   [   ]
    A) A/D   B) D/A   C) AC to DC   D) Voltage to current

11. In a weighted resistor DAC, each bit has a ------- resistor.   [   ]
    A) Same   B) Infinite   C) Zero   D) Different weighted

12. R-2R Ladder DAC uses only ------- values of resistors.   [   ]
    A) Variable   B) Three   C) None   D) Two

13. In an inverted R-2R DAC, output polarity is------   [   ]
    A) Positive   B) Alternating   C) Floating   D) Negative

14. What is the purpose of an ADC   [   ]
    A) Store signals   B) Convert A/D   C) Amplify current   D) Reduce voltage

15. Flash ADC is also called ------- type.   [   ]
    A) SAR   B) Dual slope   C) Counter   D) Parallel comparator

16. A counter-type ADC uses a ------- counter.   [   ]
    A) Decrementing   B) Binary   C) Analog   D) Loop

17. Successive Approximation ADC uses a-----   [   ]
    A) Timer   B) Ramp generator   C) Binary search method   D) Frequency counter

18. A dual-slope ADC is ------- but very accurate.   [   ]
    A) Fast   B) Slow   C) Inaccurate   D) Unstable

19. Resolution of a DAC refers to-----   [   ]
    A) Power rating   B) Smallest output change   C) Clock speed   D) Voltage input

20. Linearity of a DAC means   [   ]
    A) Output is random   B) Follows sine wave   C) Output changes uniformly   D) No signal

21. Which component in a series regulator controls the output voltage   [   ]
    A) Zener diode   B) Pass transistor   C) Resistor   D) Capacitor

22. A switching regulator improves efficiency by-----   [   ]
    A) Heating up   B) Rapidly turning on and off   C) Reducing frequency   D) Increasing resistance

23. The IC 723 can be used for both ------- voltage regulation. [　]
    A) AC and DC　　　　B) Positive and　　　C) High and low　　　D) Steady and
    　　　　　　　　　　　negative　　　　　　　　　　　　　　　　　　variable

24. Which type of regulator uses a reference voltage and comparator [　]
    A) Linear　　　　　　B) Thermoelectric　　C) Diode-only　　　　D) Switching

25. The dropout voltage in a linear regulator is the difference between----- [　]
    A) Load and input　　B) Ground and output　C) Input and output　D) Vcc and ground

26. Which regulator can be used to step up voltage [　]
    A) Buck　　　　　　　B) Linear　　　　　　C) Boost　　　　　　D) Series

27. What is the main function of a buck-boost converter [　]
    A) Lower output only　B) Raise output only　C) Block DC　　　　　D) Either increase or
    　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　decrease output
    　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　voltage

28. Which part of a switching regulator stores energy [　]
    A) Capacitor　　　　　B) Inductor　　　　　C) Transistor　　　　D) Zener diode

29. The IC 723 uses an internal reference voltage of about [　]
    A) 1.2V　　　　　　　B) 3.3V　　　　　　　C) 7.15V　　　　　　D) 9V

30. A DAC converts digital data to a/an -------- signal. [　]
    A) Binary　　　　　　B) Clock　　　　　　C) Analog　　　　　　D) Pulse

31. Which DAC type uses binary-weighted resistors [　]
    A) Weighted resistor　B) R-2R DAC　　　　C) Flash DAC　　　　D) PWM
    DAC

32. What is the main advantage of an R-2R ladder DAC [　]
    A) Variable resistors　B) Uses only two　　C) Needs high power　D) No linearity
    　　　　　　　　　　　resistor values

33. The resolution of an n-bit DAC is equal to---- [　]
    A) $1/n$　　　　　　　B) $1/(2^n)$　　　　　C) 2^n　　　　　　　D) n^2

34. What defines the speed of an ADC [　]
    A) Power rating　　　B) Resolution　　　　C) Conversion time　D) Clock voltage

35. Which ADC type is the fastest [　]
    A) Dual slope　　　　B) SAR　　　　　　　C) Counter　　　　　D) Flash

36. A successive approximation ADC has --------- speed and accuracy. [　]
    A) Low, low　　　　　B) Medium, good　　C) High, low　　　　D) Low, high

37. Dual slope ADCs are used for -------- measurements. [　]
    A) High-speed　　　　B) AC　　　　　　　C) Precision　　　　D) Wireless

38. In a dual slope ADC, the reference voltage is applied during the --------- phase. [　]
    A) Integration　　　　B) De-integration　　C) Sampling　　　　　D) Delay

39. Monotonicity in DACs means output always -------- with input. [　]
    A) Stays same　　　　B) Decreases　　　　C) Resets　　　　　　D) Increases or stays
    　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　constant

40. Linearity error in a DAC is the difference between actual and -------- output [　]
    A) Voltage　　　　　　B) Ideal　　　　　　　C) Digital　　　　　　D) Clocked

UNIT –V
DIGITAL ICS

1. CMOS logic gates consume ------- power.   [   ]
   A) High   B)   Low   C) Medium   D) No

2. CMOS stands for -------.   [   ]
   A) Control Mode   B) Coded MOS   C) Complementary   D) Central MOS
   Operation   Metal Oxide
                                                          Semiconductor

3. A basic CMOS inverter uses ------- transistors.   [   ]
   A) One   B) Three   C) Four   D) Two (PMOS +
                                                                                       NMOS)

4. NAND and NOR are called ------- gates.   [   ]
   A) Secondary   B) Universal   C) Logicless   D) Passive

5. CMOS 4011 is a ------- gate IC.   [   ]
   A) NAND   B) NOR   C) AND   D) OR

6. TTL logic families start with number -------.   [   ]
   A) 4000   B) 74XX   C) 555   D) 723

7. Code converters are used to convert ----.   [   ]
   A) Analog to Digital   B) Clock to pulse   C) Binary to BCD or   D) None
                                                          Gray code

8. A decoder does the function of ---- input.   [   ]
   A) Multiplying   B) Storing   C) Inverting   D) Activating one
                                                                                       output based on binary
                                                                                       input

9. An encoder converts multiple inputs into a ---- code.   [   ]
   A) Sound   B) Binary   C) Pulse   D) Digital

10. A priority encoder gives output based on ----.   [   ]
    A) Sum   B) Highest input   C) Lowest signal   D) Last input
                              priority

11. A multiplexer selects ---- input(s) for output.   [   ]
    A) Multiple   B) Random   C)) One   D) All

12. A demultiplexer routes input to ---- output(s).   [   ]
    A) One   B)) Multiple   C) Zero   D) Single

13. 7483 IC is used as ----.   [   ]
    A) 4-bit Binary Adder   B) Decoder   C) Flip-flop   D) Comparator

14. A magnitude comparator compares ----.   [   ]
    A) Voltages   B) Binary numbers   C) Clocks   D) Frequencies

15. Flip-Flops are ---- devices.   [   ]
    A) Combinational   B) Analog   C) Sequential   D) Digital only

16. A D Flip-Flop stores ---- bit.   [   ]
    A)2   B)1   C)4   D)8

17. A JK Flip-Flop has how many stable states?   [   ]
    A)3   B)4   C)2   D) None

18. T Flip-Flop toggles when ----.   [   ]
    A) Input is low   B) Input is high and   C) No clock   D) Reset is active
                              clock pulses

19. A synchronous counter changes state with ----.   [   ]
    A) Random input   B) Input voltage   C) Clock signal   D) Noise

20. A decade counter counts up to ----.   [   ]
    A)8   B)11   C)16   D)10

21. Shift registers move data ----.   [   ]
    A) Randomly   B) In parallel   C) Bit by bit   D) In analog

22. 74LS194 is a ---- shift register.   [   ]
    A) 4-bit bidirectional   B) 8-bit   C) 4-bit bidirectional   D) Decoder

23. A ring counter is a type of ---- counter.   [   ]
    A) Up-down   B) Shift register-based   C) Ripple   D) Random

24. Shift registers can be used to convert ---- to ---- data.   [   ]
    A) Serial to parallel   B) Analog to digital   C) Clock to signal   D) Data to clock

25. 74LS194 is a ---- shift register IC.   [   ]
    A) 8-bit   B) 4-bit bidirectional   C) 2-bit unidirectional   D) Tri-state

26. A flip-flop is a basic storage element in ---- logic   [   ]
    A) Linear   B) Analog   C) Sequential   D) Parallel

27. Which gate is used in SR flip-flop design   [   ]
    A) XOR   B) NOR or NAND   C) NOT   D) OR

28. The master-slave JK flip-flop avoids ---- problems.   [   ]
    A) Overvoltage   B) Race-around   C) Underclock   D) Parity

29. Which flip-flop is used in most counters?   [   ]
    A) D   B) SR   C) T   D) Gated

30. Sequential circuits depend on ---- inputs.   [   ]
    A) Voltage   B) Resistor values   C) Parallel buses   D) Present input and past states

31. A ripple counter is also known as a ---- counter.   [   ]
    A) Synchronous   B) Ring   C) Asynchronous   D) Bidirectional

32. In ripple counters, flip-flops are triggered by the ---- output.   [   ]
    A) Same   B) Previous stage   C) Clock directly   D) Power supply

33. Which counter can count both up and down?   [   ]
    A) Ring counter   B) Ripple counter   C) Up-down counter   D) Johnson counter

34. The propagation delay in asynchronous counters is ----.   [   ]
    A) Zero   B) Accumulated per flip-flop   C) Constant   D) Negative

35. A Johnson counter is a type of ---- counter.   [   ]
    A) Binary   B) Ripple   C) Shift register-based   D) Full-adder

36. How many states does a 4-bit Johnson counter have?   [   ]
    A)4   B)8   C)16   D) 2n = 8

37. What is the function of a clock in sequential circuits?   [   ]
    A) Control voltage   B) Supply power   C) Synchronize data movement   D) Add delay

38. . In a 4-bit synchronous counter, all flip-flops are triggered by the ----.   [   ]
    A) Previous output   B) Same clock   C) Output of first FF   D) Ground

39. Which IC is a 4-bit synchronous binary counter?   [   ]
    A) 7400   B) 74151   C) 74161   D) 7474

40. Flip-flops are also called ---- devices.   [   ]
    A) Timing   B) Bistable   C) Single-shot   D) Cascade

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