

# **KAMARAJ COLLEGE (Autonomous)**

Accredited with A+ Grade by NAAC

(Affiliated to Manonmaniam Sundaranar University, Tirunelveli)

THOOTHUKUDI – 628 003

**( 6 Pages)**

**Reg. No: .....**

**Question. Code No : 2400334**

**Sub Code : 24PEPH14**

**PG Degree - End Semester Examinations , November 2024**

**First Semester**

**M.Sc. Physics**

**Elective - LINEAR AND DIGITAL ICs AND APPLICATIONS**

**(For those who joined in July 2024 onwards)**

**Time : 3 Hours**

**Maximum : 75 Marks**

**PART - A ( $10 \times 1 = 10$  Marks)**

**Answer ALL Questions**

**Choose the correct answer :**

1. Which of the following statement is correct for an ideal Op – amp?
  - (a) Zero input impedance and infinite bandwidth
  - (b) Infinite input impedance and infinite bandwidth
  - (c) Infinite input impedance and zero bandwidth

- (d) Zero input impedance and zero bandwidth
2. If the gain  $A$  of an inverting amplifier is 4.9, with an input resistor value of  $2.2\text{ k}\Omega$ , what value of feedback resistor is necessary?
- (a)  $10.78\text{ k}\Omega$  (b)  $107.8\text{ k}\Omega$   
(c)  $2.4\text{ k}\Omega$  (d)  $10.78\text{ }\Omega$
3. A good sample and hold circuit have
- (i) High input impedance  
(ii) High output impedance  
(iii) Low input impedance  
(iv) Low output impedance
- (a) (i) and (ii) only (b) (ii) and (iii) only  
(c) (iii) and (iv) only (d) (iv) and (i) only
4. If a capacitor is placed in the feedback path of an op – amp circuit, then the circuit can act as
- (a) integrator (b) multiplier  
(c) logical (d) subtractor
5. An astable multivibrator has component values  $R_A=R_B=R= 10\text{ k}\Omega$  and  $C_1=C=120\text{ pF}$ . The frequency of circuit oscillation is given by
- (a)  $58.4\text{ Hz}$  (b)  $5.84\text{ kHz}$   
(c)  $40.3\text{ kHz}$  (d)  $4.03\text{ Hz}$
6. Which filter type is called a flat-flat filter?
- (a) Cauer filter (b) Butterworth filter  
(c) Chebyshev filter (d) Band-reject filter
7. Choose the best answer regarding the load regulation
- (a) The process of keeping the load voltage constant irrespective of any change in AC supply

- (b) The process of keeping the load voltage constant irrespective of variations in load current
  - (c) The process of keeping load voltage constant irrespective of variations in source current
  - (d) The process of keeping load current constant irrespective of variations in AC supply
8. Identify the correct statement
- (a) Successive approximation type is AD converter
  - (b) Counter type is DA converter
  - (c) Dual slope type is DA converter
  - (d) R – 2R Ladder is AD converter
9. A device which changes from serial data to parallel data is
- (a) Multiplexer
  - (b) Demultiplexer
  - (c) Flip-flop
  - (d) Counter
10. In general, \_\_\_\_\_ is used to construct shift registers.
- (a) Half adder
  - (b) full adder
  - (c) D-Flip flop
  - (d) any one of the above

**PART B – (5X5=25 Marks)**

**Answer ALL Questions choosing either (a) or (b).**

**Answer should not Exceed 250 words.**

11. (a) Brief about the ideal characteristics of an operational amplifier

**(OR)**

- (b) Discuss the nullification of the operational amplifier input offset voltage
12. (a) Using Op-amp, explain the method of current to voltage converter with neat circuit diagram

**(OR)**

- (b) Describe the construction and working principle of Schmitt trigger
13. (a) A first order low pass active filter has a cut off frequency of 10KHZ and gain of Unity at the low frequency. Find the voltage transfer function magnitude in dB at 12 KHZ for the filter

**(OR)**

- (b) Explain the operation of monostable multivibrator using IC 555
14. (a) Differentiate IC Voltage regulator from the operational amplifier regulator

**(OR)**

- (b) Apply the concept of digital electronics to convert the analog input to the digital output through successive approximation type.
15. (a) Explain 1 to 16 multiplexer with truth table and circuit diagram

**(OR)**

- (b) Implement the CMOS logic for the function  $\overline{AB + CD}$

**PART C - (5 x 8 = 40 Marks)**

**Answer ALL Questions choosing either (a) or (b).**

**Answer should not Exceed 600 words.**

16. (a) Outline the operational amplifier internal circuit and describe the emitter coupled differential amplifier with neat circuit diagram

**(OR)**

- (b) Explain the AC characteristics of an operational amplifier
17. (a) Set up an analog computer to solve the second order differential equation

$$\frac{d^2y}{dt^2} + 20 \frac{dy}{dt} + 100y = 25t$$

**(OR)**

- (b) Explain
- (i) Log amplifier and
  - (ii) Antilog Amplifier using IC with neat circuit diagram.
18. (a) Discuss second order low pass filter using IC 741 and study its frequency response

**(OR)**

- (b) Describe the voltage-controlled oscillator with a block and circuit diagram and give its frequency.
19. (a) Using functional block diagram. Discuss (i) IC 723 General Purpose Regulator and (ii) Basic high voltage 723 regulator.

**(OR)**

- (b) Illustrate R-2R ladder method to convert Digital Signal into Analog Signal.
- 20. (a) Discuss 4 bit asynchronous binary counter with logic diagram and truth table (IC 7493)

**(OR)**

- (b) Design a circuit to convert BCD to seven segment decoder (IC 7447).