KAMARAJ COLLEGE (Autonomous)

Accredited with A+ Grade by NAAC

(Affiliated to Manonmaniam Sundaranar University, Tirunelveli)

THOOTHUKUDI – 628 003

(5 Pages) **Reg. No: ……**

Question Code No : 25O003310 **Course Code : 24PEPH14**

PG Degree - End Semester Examinations, November 2025

First Semester

M.Sc. PHYSICS

Linear and Digital ICS and Applications

(For those who joined in July 2024 onwards)

Time : 3Hours **Maximum : 75 Marks**

PART – A (10 × 1 = 10 Marks)

Answer ALL Questions

Choose the correct answer :

1. Which IC is commonly used as a general-purpose operational amplifier?

   (a) IC 565 (b) IC 723

   (c) IC 741 (d) IC 555

2. In an inverting op-amp, the input is applied to

   (a) Non-inverting terminal (b) Output

(c) Inverting terminal (d) Both terminals

3. Instrumentation amplifier is primarily used for

(a) High common-mode rejection ratio (b) High power output

(c) Low input impedance (d) High current gain

4. Which filter provides constant gain over a pass band?

(a) Band-stop filter (b) All-pass filter

(c) Butterworth filter (d) High-pass filter

5. An all-pass filter is mainly used for

(a) Attenuating noise (b) Power amplification

(c) Frequency selection (d) Phase correction

6. A Schmitt trigger is mainly used for

(a) Amplifying low-level signals (b) Removing noise and providing hysteresis

(c) Converting analog to digital (d) Generating sine waves

7. Which regulator offers high efficiency due to rapid switching action?

(a) Zener diode regulator (b) Linear series regulator

(c) Switching regulator (d) IC 723 regulator

8. The dual slope ADC is preferred in digital voltmeters because of

(a) High resolution and noise rejection
(b) Low power supply requirement
(c) High conversion speed
(d) Simplicity of design

9. The IC 7447 is commonly used as
(a) Flip-flop
(b) Multiplexer
(c) BCD to 7-segment decoder
(d) Encoder

10. The IC used for 7-segment decoding is
(a) IC 74194
(b) IC 7447
(c) IC 7473
(d) IC 7483

PART – B (5 X 5 = 25 Marks)

Answer ALL Questions choosing either (a) or (b).
Answer should not exceed 250 words.

11. (a) List the characteristics of an ideal op-amp.

(OR)

(b) Discuss the DC characteristics of the IC 741 op-amp.

12. (a) Describe the construction and working of an instrumentation amplifier.

(OR)

(b) Explain the function of a Schmitt trigger circuit.

13. (a) Draw the circuit of an all pass filter and explain its working.

(OR)

(b) With a neat diagram, explain the functional block diagram of the 555 timer IC.

14. (a) List and explain the characteristics of three terminal IC voltage regulator.

(OR)

(b) In an inverted R-2R ladder DAC with $R = R_f = 10k\Omega$ and $V_R = 10V$, Calculate the output voltage for the binary output of 1110.

15. (a) Write short notes on CMOS NAND and NOR gates.

(OR)

(b) Explain the working of IC 7493 as a 4-bit asynchronous binary counter.

PART – C (5 X 8 = 40 Marks)

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

Answer should not exceed 600 words.

16. (a) With a neat diagram, explain the internal circuit of op-amp 741 and highlight its features.

(OR)

(b) Explain in detail the inverting and non-inverting mode of operation.

17. (a) Draw and explain the operation of V to I and I to V converter.

(OR)

(b) With a circuit diagram, explain the working principle of square wave generator.

18. (a) With circuit diagram, explain the working of second-order Butterworth low-pass filter.

(OR)

(b) List the applications of PLL and explain any two with diagrams.

19. (a) Explain the working of IC 723 as a general-purpose regulator.

(OR)

(b) Explain the operation of dual slope ADC.

20. (a) Explain the design and operation of a universal shift register (IC 74194).

(OR)

(b) Discuss the working of IC 7485 comparator and IC 7447 BCD to 7-segment decoder.