KAMARAJ COLLEGE (Autonomous)

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(Affiliated to Manonmaniam Sundaranar University, Tirunelveli)

(4 Pages) **Reg. No:……**

Question Code: 26O03311 **Course Code : 25PMPH13**

PG Degree - End Semester Examinations, November 2026

First Semester

M.Sc. PHYSICS

Linear and Digital ICs and Applications Digital

(For those who joined in June 2025 onwards)

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

PART – A (10 × 1 = 10 Marks)

Answer ALL Questions

Choose the correct answer:

CO:1 K:1 1. In a basic differentiator circuit, which component is connected in series with the input signal?

(a) Resistor (b) Capacitor

(c) Inductor (d) Diode

CO:1 K:2 2. The output of an ideal op-amp integrator for a constant DC input voltage is:

(a) A sinusoidal signal (b) A linearly increasing or decreasing ramp signal

(c) A constant DC output (d) A square wave signal

CO:2 K:1 3. Which of the following application uses voltage to current converter?

(a) Low voltage dc and ac voltmeter (b) Diode match finding

(c) Light emitting diode (d) All of the above

CO:2 K:2 4. In an instrumentation amplifier using transducer bridge, which device measure the change in physical energy:

(a) Resistive transducer (b) Indicating meter

(c) Capacitive transducer (d) Inductor circuit

CO:3 K:1 5. A first order low pass filter has a ____ dB decade roll-off rate

(a) -5 (b) -10

(c) -15 (d) -20

CO:3 K:2 6. Determine the time period of a monostable 555 multivibrator?

(a) T = 0.33RC (b) T = 1.1RC

(c) T = 3RC (d) T = RC

CO:4 K:1 7. The time taken for the output to settle within a specified band of its final value is referred as:

(a) Conversion time (b) Settling time

(c) Take off time (d) All of the above

CO:4 K:2 8. Find out the resolution of 8 bit DAC/ADC?

(a) 256 (b) 265

(c) 562 (d) 625

CO:5 K:1 9. The main advantage of CMOS over TTL devices is its

(a) Much reduced power dissipation (b) High operating speed

(c) Extremely low cost (d) Very small physical size

CO:5 K:2 10. What is the standard dual-in-line package (DIP) pin count for both the IC 7474 and IC 7473 integrated circuits?

(a) 8 pins (b) 14 pins

(c) 32 pins (d) 64 pins

PART – B (5 X 5 = 25 Marks)

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

Answer should not exceed 250 words.

CO:1 K:3 11. (a) List the characteristics of an ideal op-amp.

(OR)

(b) Design an Op-Amp differentiator that will differentiate an input signal with f_{max} = 100 Hz.

CO:2 K:3 12. (a) Draw and explain the operation of a voltage to current converter with floating and Grounded load.

(OR)

(b) Draw a Sample and Hold circuit. Explain its operation with the suitable circuit diagram.

CO:3 K:3 13. (a) Draw and explain the functional diagram of a IC 555 timer.

(OR)

(b) Explain (i) Capture range (ii) Lock-in range (iii) Pull-in time.

CO:4 K:4 14. (a) Explain the important parts of a series regulated power supply using discrete components.

(OR)

(b) (i) Classify DACs on the basis of their output.
(ii) Calculate the values of the LSB, MSB and full-scale output for an 8-bit DAC for the 0 to 10 V range.

CO:5 K:3 15. (a) Construct the CMOS logic for NAND and NOR gates

(OR)

(b) Explain the operation of D-Flip-Flop with truth table and diagram.

PART – C (5 X 8 = 40 Marks)

Answer ALL Questions choosing either (a) or (b).
Answer should not exceed 600 words.

CO:1 K:3 16. (a) Explain and draw the output waveforms of an integrator circuit with the suitable diagram and also show the response of an integrator for the following inputs: (i) Sine wave input, and (ii) square wave input.

(OR)

(b) Derive for the gain, input resistance and output resistance of an inverting Op-Amp.

CO:2 K:4 17. (a) Explain the operation of Log and Antilog amplifier with the neat circuit diagram.

(OR)

(b) With the suitable circuit diagram, explain the operation of a Schmitt trigger using comparator.

CO:3 K:5 18. (a) With the neat circuit diagram, describe the operation of First Order Low Pass and First Order High Pass Filter.

(OR)

(b) Describe the working of Astable Multivibrator using IC 555 timer with the suitable diagram.

CO:4 K:3 19. (a) Describe the function of R-2R Ladder DAC with the neat diagram.

(OR)

(b) Describe the working of Parallel (or) flash ADC with the neat diagram.

CO:5 K:3 20. (a) Explain the operation of Universal Shift Register with the neat diagram.

(OR)

(b) Discuss the working of 4-bit asynchronous binary counter with logic diagram and truth table.