

(8 pages)

Reg. No. :

Code No. : 7762

Sub. Code : WPHM 13

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2023.

First Semester

Physics — Core

LINEAR AND DIGITAL ICS AND APPLICATIONS

(For those who joined in July 2023 onwards)

Time : Three hours

Maximum : 75 marks

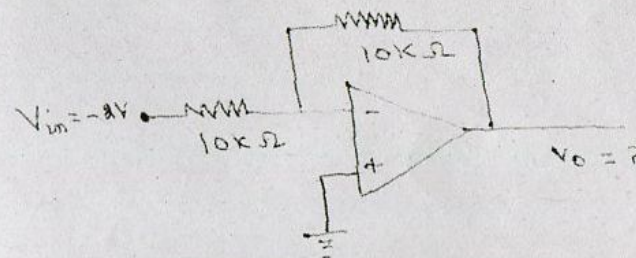
PART A — ($15 \times 1 = 15$ marks)

Answer ALL questions.

Choose the correct answer :

1. _____ the value of CMRR, better is the operational amplifier.
(a) Lower
(b) Higher
(c) Neither lower nor higher
(d) Both lower and higher

2. The operational amplifier has high gain dc coupled _____ feedback amplifier.
(a) Negative
(b) Positive
(c) Zero
(d) Both positive and negative
3. The output voltage of the Op-Amp is $V_o =$ _____.



- (a) $-2V$
(b) $-3V$
(c) $+2V$
(d) $+3V$
4. _____ circuit converts an irregular shaped waveform to square wave.
(a) Astable
(b) Monostable
(c) bistable
(d) Schmitt trigger

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5. _____ has one stable state and the other is quasi stable state.
- Bistable Multivibrator
 - Schmitt trigger
 - Astable Multivibrator
 - Monostable Multivibrator
6. The sample and hold circuit is commonly used in _____ system.
- Digital to Analog
 - Analog to Digital
 - Pulse Modulation
 - None
7. D/A converter is called as _____.
- Multiplexer
 - Demultiplexer
 - Encoder
 - Decoder
8. A flip-flop has _____ stable states.
- Two
 - Three
 - Four
 - Five
9. The four bit binary counter counts _____.
- 0 to 16
 - 0 to 15
 - 1 to 15
 - 0 to 14

10. For a four input resistive divider circuit ($0 = 0\text{ V}$, $i = +10\text{ V}$) the full scale output voltage is _____.
- 0 V
 - +5 V
 - +10 V
 - 10 V
11. _____ regulator is more efficient than the linear regulator.
- Positive or negative
 - Adjustable voltage
 - Fixed output voltage
 - Switching
12. To construct four bit shift register _____ flip-flops are needed.
- Two
 - Four
 - Eight
 - Sixteen
13. Notch filter is useful for the rejection of single frequency such as _____ powerline frequency hum.
- 50 Hz
 - 100 Hz
 - 150 Hz
 - 200 Hz



14. If the Duty cycle of Astable multivibrator is 50%, then the output is _____ wave.

- (a) Sine (b) Triangular
(c) Asymmetrical (d) Symmetrical

15. The 555 timer can be used with supply voltage in the range of _____.

- (a) +5 V to 18 V (b) +5 V to 25 V
(c) +5 V to 50 V (d) +5 V to 30 V

PART B — ($5 \times 4 = 20$ marks)

Answer ALL questions, choosing either (a) or (b).

16. (a) Write the ideal characteristics of an operational amplifier.

Or

(b) Explain input offset voltage of an operational amplifier and how it is nullified?

17. (a) Draw and explain current to voltage converter using operational amplifier.

Or

(b) Describe multiplier circuit using operational amplifier with neat schematic symbol.

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18. (a) A first order low pass Butterworth active filter has a cut off frequency of 10 KHz and unity gain at low frequency. find the voltage transfer function magnitude in dB at 12 KHz for the filter.

Or

(b) Explain the operation of Astable Multivibrator using IC 555 with circuit diagram.

19. (a) Discuss series operational amplifier regulator with circuit diagram.

Or

(b) Calculate the values of LSB, MSB and full scale output for an 8-bit DAC for the 0 to 10 V range.

20. (a) Explain 1 to 16 Demultiplexer with truth table and circuit diagram.

Or

(b) Give the operation of D-flip-flop with truth table and diagram.

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PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

21. (a) Describe the emitter coupled differential amplifier with neat circuit diagram.

Or

- (b) Define slew rate of an operational amplifier.

Show that $f_{\max} = \frac{S_R}{2\pi V_p}$. Given that $V = V_p$ circuit.

22. (a) Set up an analog computer to solve the second order differential equation

$$\frac{d^2 y}{dt^2} + 5.4 \frac{dy}{dt} + 0.58y = u(t)$$

with initial conditions $y(0) = -4.8$ and

$$\left. \frac{dy}{dt} \right|_{t=0} = \dot{y}(0) = 2.$$

Or

- (b) Explain (i) Log amplifier and (ii) Antilog amplifier using IC with neat circuit diagram.

23. (a) Discuss second order low pass filter using IC 741 and study its frequency response.

Or

- (b) Why monostable multivibrator is called as one shot multivibrator. Explain the operation of monostable multivibrator using IC 555 with neat circuit diagram.

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24. (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.

25. (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).

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