

Total number of printed pages-4

3 (Sem-5/CBCS) PHY HE 4

2023

**PHYSICS**

(Honours Elective)

Paper : PHY-HE-5046

**(Physics of Device and Instruments)**

Full Marks : 60

Time : Three hours

**The figures in the margin indicate full marks for the questions.**

1. Answer the following questions:  $1 \times 7 = 7$

(i) Why silicon is used in IC fabrication ?

(ii) What is the maximum length of GPIB bus ?

(iii) A field-effect transistor is basically a \_\_\_\_\_ resistor. (Fill in the blank)

(iv) If  $f_c$  is the frequency of the carrier wave and  $f_m$  that of modulating wave then

(a)  $f_c < f_m$  (b)  $f_c = f_m$  and (c)  $f_c > f_m$

(Choose the correct answer)

Contd.

- (v) If  $m_a$  is the modulation index of an AM wave, then for distortionless transmission,  
 (a)  $m_a > 1$  (b)  $m_a = 1$  and (c)  $m_a < 1$   
 (Choose the correct answer)
- (vi) What is a phase-locked loop (PLL)?
- (vii) What is an active filter?
2. Answer the following questions :  $2 \times 4 = 8$
- (i) Why is modulation necessary in communication system?
- (ii) What is the difference between JFET and MOSFET?
- (iii) What are the applications of phase locked loop (PLL)?
- (iv) What are *four* types of integrated circuit (IC)?
3. Answer **any three** questions of the following :  $5 \times 3 = 15$
- (i) Mention some of the applications of RS-232 communication. State advantages and disadvantages of RS-232 communication.  $2 + 3 = 5$
- (ii) Draw the circuit diagram of amplitude modulating system and discuss the operation of the circuit.  $2 + 3 = 5$
- (iii) Diffusion and Implementation technique in semiconductor. Explain.
- (iv) What is digital modulation technique? Explain the three digital modulation ASK, FSK and PSK with graph.  $1 + 4 = 5$
- (v) Write short notes on **any two** of the following :  $2 \frac{1}{2} + 2 \frac{1}{2} = 5$
- (a) Tunnel Diode
- (b) Diode Detector
- (c) Line and Load regulation of power supply.
4. Answer **any three** questions :  $10 \times 3 = 30$
- (i) Show that an AM wave can be represented by a carrier and two side frequency bands on the either side of the carrier frequency.  
 Draw the amplitude modulated waveform showing  $m_a > 1$ ,  $m_a = 1$  and  $m_a < 1$ .  $5 + 5 = 10$
- (ii) Draw the circuit symbol of MOSFET. Draw a typical set of drain characteristics of a P-channel enhancement type MOSFET. What is a transfer characteristics?  $3 + 4 + 3 = 10$

(iii) What is multivibrator? Draw the circuit diagram of a bistable multivibrator and explain its principle of action, showing the collector voltage waveform.

2+3+5=10

(iv) What is a universal serial bus (USB)? What are its different types explain? Discuss the advantages and disadvantages of USB.

2+4+4=10

(v) Explain block diagram of regulated power supply with neat diagram. What are different types of IC voltage regulators? Draw their circuit diagram.

5+2+3=10

(vi) What are the basic steps of IC fabrication? What is electronic grade silicon used for? Explain optical and electron lithography. What is the difference between them?

3+1+3+3=10