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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

