Total number of printed pages–7

1 (Sem–4/AR) PHY 03 (A)

Anandaram Dhekial Phookan College Library * Acc. No. Date * Nagaon : Assam *

2026

PHYSICS

(Major/Minor–1)

Paper : PHY0400304

(Analog Electronics)

Full Marks : 45

Time : 2 hours

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

1. Answer the following questions : 1×5=5

(a) In case of h-type semiconductor Fermi level (E_F) lies _____ the conduction band (E_C).

(b) Write down the relation between current gain α and β.

(c) Define the stability factor of transistor.

(d) PIV for full wave rectifier is $2V_m$. Is this statement is true ***or*** false ?

(e) What is the gain of negative feedback amplifier if A is the gain of the amplifier without feedback ?

2. Answer the following questions : ***(any five)*** 2×5=10

(a) Define thermal runway. What is the effect of transistor due to thermal runway ?

(b) Draw a block diagram of a differential amplifier.

(c) What do you mean by Bandwidth of R-C coupled amplifier ?

(d) Find the expression for voltage gain of a voltage follower.

Mahapurusha Srimanta Sankaradeva Viswavidyalaya Regional Centre Lahekial Phookan College Library Acc. No. Date Nagaon : Assam

(e) How can you measure the phase difference between two signal by using CRO ?

(f) If three $5k\Omega$ resistance are available with $2k\Omega$ feedback resistance, then draw the OPAMP adder circuit.

(g) How Zener diode is used as a voltage regulator ?

(h) Explain the operation of a C-filter.

(i) If voltage gain for differential input signal is 1000 and voltage gain for common mode signal is 100 then find the CMRR of the OPAMP.

(j) What do you mean by DC load line of a transistor?

3. Answer the following questions : ***(any four)*** 5×4=20

(a) Describe voltage divider bais method for transistor and find the expression for stability factor.

(b) Explain the current flow mechanism in reverse biased PN junction.

(c) Discuss the operation of OPAMP as a differentiator.

Anandaram Dhekiaphukan College Library * Nagaon : Assam *
Acc. No.
Date

(d) What do you mean by hybride parameter? Describe the hybride equivalent circuit of a transistor.

(e) Describe single stage common collector amplifier with circuit diagram. Draw its hybride equivalent circuit.

(f) A $10PF$ capacitor is used in a RC phase shift oscillator, then find the value of resistance required in each RC section to produce $10kHz$ frequency.

(g) Write down the working principle of photodiode. Explain *two* applications of it.

(h) In a common base transistor connection $\alpha = 1{\cdot}5$. The voltage drop across the collector load is $5k\Omega$ is $10V$. Find the base current.

4. Answer the following questions : ***(any one)*** 10×1=10

(a) Explain the working principle of a R-C coupled amplifier with circuit diagram and frequency response curve. Find out its magnitude of high frequency voltage gain using equivalent circuit. 6+4=10

(b) Explain the operation of Colpitt's oscilator with circuit diagram. Find the expression for its frequency and condition for its sustained oscillation. 4+3+3=10

(c) Describe a bridge full wave rectifier. Find the expressions for peak inverse voltage, rectification efficiency and ripple factor for bridge full wave rectifier. The RMS value for a bridge rectifier is $50V$ and load resistance is $1k\Omega$. Find the PIV, if forward resistance of each diode of the bridge rectifier is 5Ω. 6+4=10

Bhakiai Phadikan College Library * Nagaon : Assam * Acc. No. Date

(d) What do you mean by ideal OPAMP? Draw the systematic diagram of an OPAMP indicating various terminal. Why negative feedback is needed in an operation amplifier? Explain the operation of OPAMP as an inverting amplifier. Determine the voltage gain for common mode input signal of an OPAMP, if V_1 and V_2 are $5mV$ and $10mV$ and V_0 is $45mV$. 2+2+2+2+2=10