

FYUGP/5th Sem/25(NEP)

2025

Four Year Under Graduate Programme (FYUGP)

5th Semester Examination (Under NEP)
(Session 2023-24)

PHYSICS (Major)

Paper Code : PHSMJ MC-08

(Analog Systems and Applications)

Full Marks : 30

Time : Two Hours

*The figures in the margin indicate full marks.
Candidates are required to give their answers
in their own words as far as practicable.*

1. Answer any six questions :

1×6=6

- (a) What is meant by dynamic resistance of a PN junction diode?
- (b) What is pinch-off voltage in a JFET?
- (c) If the value of α of a transistor is 0.98, then what is the value of β ?
- (d) What is Zener potential?
- (e) What is the function of filter in a rectifier circuit?
- (f) In a BJT, why the base region is kept very thin?

P.T.O.

(2)

(g) What is meant by phase reversal?

(h) Which amplifier is used for impedance matching?

2. Answer any *three* questions :

3×3=9

(a) Compare centre-tapped and bridge full-wave rectifiers with respect to ripple factor and efficiency.

(b) Write down the working principle of a photodiode.

(c) An OP-AMP has an open-loop gain of 10^5 . If a negative feedback of 1% is applied, calculate the closed-loop gain.

(d) An inverting op-amp has input resistance $5\text{ k}\Omega$ and feedback resistance $50\text{ k}\Omega$. If the input voltage is 0.2 V , calculate the output voltage.

(e) Explain the concept of virtual ground and CMRR.

3. Answer any *three* questions :

5×3=15

(a) Discuss transistor biasing and stabilization. Derive the expression for stability factor of voltage divider bias.

(b) With neat circuit diagram, explain the operation of an astable Multivibrator and derive the expression for its time period.

(c) Explain the construction and working of a junction field-effect transistor (JFET) and derive the expression for drain current.

(3)

- (d) Draw the circuit diagram of a Wien bridge oscillator and prove that the gain of the amplifier must be greater than 3 for sustained oscillations.
- (e) Briefly explain Barkhausen's criterion for self-sustained oscillation. Describe the construction and working of an RC phase shift oscillator.
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