A **Reg. No. :** | | | | | | | | | | | | |

Question Paper Code:R2306

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2025

First Semester

Electrical and Electronics Engineering

R21UEE206 – PRINCIPLES OF ELECTRONICS ENGINEERING

(Regulations R2021)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The movement of free electrons in a semiconductor due to an applied electric field is called: CO1-U

   (a) Diffusion (b) Drift (c) Recombination (d) Ionization

2. The potential barrier for Silicon P-N junction at room temperature is approximately: CO1-U

   (a) 0.7V (b) 0.3V (c) 1.1V (d) 0.1V

3. The relationship between α and β is given by: CO1-U

   (a) $\beta = \alpha/(1-\alpha)$ (b) $\alpha = \beta/(1+\beta)$ (c) $\beta = \alpha/(1+\alpha)$ (d) $\alpha = \beta/(1-\beta)$

4. The most commonly used transistor configuration for amplification is: CO1-U

   (a) Common Base (b) Common Emitter

   (c) Common Collector (d) All of the above

5. In a Depletion-type MOSFET, the channel is: CO1-U

   (a) Physically constructed (b) Induced by gate (c) Not present (d) Both a and b

6. A JFET is a: CO1-U

   (a) Voltage-controlled device (b) Current-controlled device

   (c) Pressure-controlled device (d) Temperature-controlled device

7. The purpose of a bypass capacitor in a CE amplifier is to: CO1-U

   (a) Block DC (b) Increase gain

   (c) Stabilize bias (d) Bypass AC component of emitter current

8. The differential gain of a differential amplifier is measured when the input is: CO1-U

(a) Common-mode (b) Differential-mode (c) Zero (d) Very large

9. The Barkhausen criterion for sustained oscillations requires: CO1-U

(a) Loop gain < 1, Phase shift = 0° (b) Loop gain > 1, Phase shift = 0°

(c) Loop gain = 1, Phase shift = 0° (d) Loop gain = 1, Phase shift = 180°

10. A crystal oscillator is preferred over an LC oscillator because of its: CO1-U

(a) Low cost (b) Small size

(c) High frequency stability (d) High output power

PART – B (5 x 2= 10 Marks)

11. Differentiate between drift current and diffusion current in a semiconductor with a neat energy band diagram. CO1-U

12. List the three regions of operation of a BJT with suitable diagrams indicating bias conditions. CO1-U

13. State the reason -JFET is called a voltage-controlled device CO1-U

14. Draw the small-signal equivalent circuit (h-parameter model) of a CE amplifier. CO1-U

15. State the Barkhausen criterion for sustained oscillations and discuss its significance in oscillator design. CO1-U

PART – C (5 x 16= 80Marks)

16. (a) Analyze the roles of diffusion and drift phenomena in semiconductors by analyzing their contributions to the overall current conduction process. CO3-Ana (16)

Or

(b) Analyze and differentiate the V–I characteristics of a PN junction diode, Zener diode, and Tunnel diode to interpret their distinct operating regions and behaviors. CO3-Ana (16)

17. (a) Explain the construction and working of a PNP transistor. CO1 - U (16)

or

(b) Describe the input and output characteristics in CB configuration. CO1 - U (16)

18. (a) Explain the construction, working, and characteristics of JFET with necessary diagrams. CO1-U (16)

or

(b) Describe the concept of channel width modulation and its effect on drain current. CO1-U (16)

19.	(a)	Explain the operation of a small-signal CE amplifier using the hybrid model with a neat circuit diagram	CO1-U	(16)
		or		
	(b)	With neat sketches, explain the concept and operation of a differential amplifier.	CO1-U	(16)
20.	(a)	Analyze the frequency stability and amplitude control mechanisms in a Wien Bridge oscillator circuit, and evaluate how component variations affect the oscillator's performance.	CO4-Ana	(16)
		or		
	(b)	Analyze a crystal oscillator circuit to interpret how its piezoelectric properties determine oscillation, and evaluate the benefits of using it over RC or LC oscillators.	CO4-Ana	(16)