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Question Paper Code : 40977

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2024.

Second/Third Semester

Electrical and Electronics Engineering

EC 3301 — ELECTRON DEVICES AND CIRCUITS

(Regulations 2021)

(Also Common to PTEC 3301 – EEE for Regulations 2023)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Define Zener breakdown and Avalanche Breakdown.
2. What is ripple factor of rectifier?
3. When a reverse gate voltage of 12V is applied to JFET, the gate current is 1nA. Determine resistance between gate and source terminals.
4. Compare the characteristics of Current controlled device and Voltage controlled device.
5. Summarize the need for biasing and bias stabilization.
6. Mention the effect of unbypassed source resistance on CS amplifier parameters.
7. What is CMRR?
8. Show a high-frequency model of a Common Source FET amplifier.
9. Show the necessary conditions for sustained oscillators.
10. Why gain-bandwidth product remains constant with the introduction of negative feedback?

PART B — (5 × 13 = 65 marks)

11. (a) Explain the significance of switching times of diode and illustrate their relevance in switching circuits.

Or

- (b) Construct a Full wave rectifier circuit using two diodes and a circuit and determine the average value, RMS value, ripple factor, efficiency and Transformer Utilization Factor (TUF).

12. (a) Explain the Construction and operation of JFET. Also obtain the expression for AC drain resistance transconductance and amplification factor.

Or

- (b) Explain the construction and working of SCR and also explain any one application of SCR with a neat circuit diagram.

13. (a) Explain the small signal analysis of a common emitter amplifier with voltage divider bias using h parameters.

Or

- (b) Explain the common source capacitor coupled amplifier and also discuss their Gain and frequency response.

14. (a) Discuss emitter coupled differential amplifier with a neat circuit diagram.

Or

- (b) Explain the operation of class B Amplifier and also deduce the efficiency of Class B amplifier.

15. (a) Explain the operation of RC phase shift oscillator and also deduce the expression for frequency of oscillations in RC phase shift oscillator.

Or

- (b) For a transistor amplifier with an unbypassed emitter resistor involving current series feedback. Determine an expression for current gain, feedback factor, and input and output impedance with and without feedback using a suitable diagram.

PART C — ($1 \times 15 = 15$ marks)

16. (a) Discuss the method of developing low frequency and high frequency models of a CE amplifier circuit using R and C elements. Using the analysis, plot the frequency response and find out the slope of the curve, and also indicate the effect to Miller capacitance in frequency response of CE amplifier.

Or

- (b) Discuss the process and equations involved in biasing a common Gate FET configuration and also design a voltage divider bias network using a depletion type MOSFET with $I_{DSS} = 10 \text{ mA}$, $V_P = -4\text{V}$ to have a Q-point at $I_{DQ} = 2.5 \text{ mA}$ using a supply of 24V . In addition, set $V_G = 4\text{V}$ and $R_D = 2.5$ times of R_S with $R_1 = 22 \text{ M}\Omega$.
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