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Question Paper Code: R2306

B.E./B.Tech. DEGREE EXAMINATION, NOV/DEC 2024

First Semester

Electrical and Electronics Engineering

R21UEE206-PRINCIPLES OF ELECTRONICS

(Regulations R2021)

Duration: Three hours

Maximum: 100 Marks

Answer All Questions

PART A - (10 x 1 = 10 Marks)

1. Which special purpose diode emits light when forward biased? CO1-U
(a) Zener diode (b) Tunnel diode (c) LED (d) Photo diode
2. What is the primary application of a photo-diode? CO1-U
(a) Voltage Regulation (b) Light detection
(c) Signal amplification (d) Frequency modulation
3. What is the primary function of an optocoupler in electronic circuits? CO1-U
(a) Voltage regulation (b) Signal amplification
(c) Isolation (d) Frequency modulation
4. What is the term used to describe the time it takes for a Bipolar Junction Transistor (BJT) to fully switch off? CO1-U
(a) Rise time (b) Fall time (c) Storage time (d) Turn-off
5. Analyze the fundamental characteristic that defines the CMOS structure, emphasizing its role in achieving efficient and complementary operation CO1-U
(a) Complementary symmetry (b) Continuous symmetry
(c) Central symmetry (d) Composite symmetry
6. In MOSFET, what type of configuration is commonly used for amplification in analog circuits? CO1-U
(a) CS configuration (b) CG configuration
(c) CD configuration (d) CMOS configuration

7. In BJT small signal modeling, what does BJT stand for? CO1-U
 (a) Bipolar Junction Transistor (b) Binary Junction Transistor
 (c) Base Junction Transistor (d) Bypass Junction Transistor
8. What does gain represent in the analysis of a CE amplifier? CO1-U
 (a) Voltage gain (b) Current gain (c) Power gain (d) Phase gain
9. What is the key characteristic of a crystal oscillator? CO1-U
 (a) Frequency stability (b) High power consumption
 (c) Variable frequency (d) Low accuracy
10. In multivibrators, what defines the operation of an astable configuration? CO1-U
 (a) Single stable state (b) Two stable states (c) No stable state (d) Infinite stable states

PART – B (5 x 2= 10 Marks)

11. Explain the working principle of a Light-emitting diode (LED) and its applications. CO1-U
12. Explain the role of power transistors in electronic circuits CO1-U
13. Explain the configurations utilized for the N-type and P-type transistors in CMOS technology CO1-U
14. Analyze the importance of multi-stage amplifiers in complex electronic systems. CO1-U
15. What makes a crystal oscillator stand out in terms of frequency stability? CO1-U

PART – C (5 x 16= 80 Marks)

16. (a) Explain the characteristics of any two special purpose diodes CO1-U (16)
 Or
 (b) Evaluate the application of a Shockley diode with its operation and its characteristics CO1-U (16)
17. (a) Analyze the input and output parameters in the Common Emitter (CE), Common Base (CB), and Common Collector (CC) configurations of a BJT, and discuss how these parameters affect the performance of amplifier circuits. CO2-Ana (16)
 Or
 (b) Explain the hybrid model for Bipolar Junction Transistors (BJTs) and demonstrate how it can be used to analyze transistor circuits in practical applications. CO2-Ana (16)

18. (a) Implement a 2-input CMOS NAND and NOR gate and justify the placement of transistors in the pull-up and pull-down networks to achieve the desired logic function. **CO3-Ana (16)**
- Or
- (b) Design a common-source JFET amplifier circuit. Explain how the pinch-off voltage and channel modulation influence the gain of the amplifier. **CO3-Ana (16)**
19. (a) Design a multistage amplifier with a specific voltage gain requirement. Explain how the choice of individual stages contributes to achieving the overall gain and performance goals. **CO3-Ana (16)**
- Or
- (b) Design a differential amplifier circuit and explain how it amplifies a differential mode signal while rejecting a common mode signal. Use specific resistor and transistor values in your design. **CO3-Ana (16)**
20. (a) Compare the frequency stability of a Clapp oscillator and a Colpitts oscillator when used in a temperature-sensitive environment. Analyze how the additional capacitor in the Clapp oscillator influences the frequency response. **CO3-Ana (16)**
- Or
- (b) Design an astable multivibrator to generate a square wave with a frequency of 1 kHz and a duty cycle of 60%. Select appropriate resistor and capacitor values and explain the calculation process. **CO3-Ana (16)**

