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**Reg. No. :**

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**Question Paper Code: R2306**

B.E./B.Tech. DEGREE EXAMINATION, MAY 2024

Second 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. What type of semiconductor has excess holes as charge carriers? **CO1- U**
  - (a) P-type semiconductor
  - (b) N-type semiconductor
  - (c) Intrinsic semiconductor
  - (d) Extrinsic semiconductor
2. Which process involves charge carriers moving from high to low concentration? **CO1- U**
  - (a) Drift
  - (b) Diffusion
  - (c) Band bending
  - (d) Recombination
3. In a common-emitter configuration, what do input characteristics primarily illustrate? **CO1- U**
  - (a) Relationship between base current and collector-emitter voltage.
  - (b) Relationship between base current and base-emitter voltage.
  - (c) Relationship between collector current and collector-emitter voltage
  - (d) Relationship between emitter current and emitter-base voltage.
4. What is the significance of the hybrid- $\pi$  model in transistor analysis? **CO1- U**
  - (a) A) Simplifies analysis by representing transistor with resistors and capacitors.
  - (b) Provides detailed breakdown of transistor behavior.
  - (c) Measures transistor performance in RF applications.
  - (d) Determines transistor's thermal characteristics

5. What defines the operation of a JFET? **CO1- U**  
 (a) Voltage-controlled resistance. (b) Current-controlled resistance.  
 (c) Voltage-controlled capacitance (d) Current-controlled capacitance.
6. Which gate isolation type is commonly used in MOSFETs? **CO1- U**  
 (a) Junction isolation (b) Dielectric isolation  
 (a) Barrier (b) Monoelectric isolation
7. BJT small-signal analysis commonly employs which model? **CO1- U**  
 (a) Hybrid- $\pi$  (b) Ebers-Moll  
 (c) T (d) H
8. Where is the input signal applied in a CE amplifier? **CO1- U**  
 (a) Base (b) Collector (c) Emitter (d) Substrate
9. What is a common condition for oscillation in electronic circuits? **CO1-U**  
 (a) Maximum voltage gain (b) Maximum current gain  
 (c) Unity loop gain with  $360^\circ$  phase shift (d) Unity loop gain with  $180^\circ$  phase shift
10. Which oscillator configuration typically utilizes inductors and capacitors for frequency generation? **CO1-U**  
 (a) LC-Hartley (b) RC-Phase shift  
 (c) Crystal oscillator (d) Wein Bridge

PART – B (5 x 2= 10 Marks)

11. Describe the formation of a P-N junction in a semiconductor. **CO1- U**
12. Describe the doping process involved in forming the PNP/NPN junctions in a bipolar junction transistor. **CO2-App**
13. Identify the features of JFETs. **CO1-U**
14. Explain the primary function of the hybrid- $\pi$  model in BJT amplifiers? **CO1- U**
15. Why quartz crystal is commonly used in crystal oscillator? **CO4-App**

PART – C (5 x 16= 80 Marks)

16. (a) Explain the concept of drift and diffusion carriers in semiconductors and their roles in current flow. **CO1-U (16)**

Or

- (b) Draw the V-I characteristics of P-N junctions diode with their input and output characteristics **CO1-U (16)**
17. (a) Analyze the formation of PNP and NPN junctions in a Bipolar Junction Transistor (BJT). How does the doping of semiconductor materials contribute to the creation of these junctions? **CO3 - Ana (16)**
- Or
- (b) Analyze the relationship between  $\alpha$ ,  $\beta$ , and  $\gamma$  in a BJT. Discuss how changes in these parameters affect the transistor's behavior in different configurations. **CO3 - Ana (16)**
18. (a) Analyze the impact of channel width modulation on the output characteristics of a FET and how it affects the device performance. **CO5 - Ana (16)**
- Or
- (b) Analyze the key characteristics of JFETs, including trans conductance, pinch-off voltage, and input impedance, and their significance in device applications. **CO5 - Ana (16)**
19. (a) Draw the circuit diagram of a voltage series feedback amplifier and derive expressions for voltage gain with and without feedback. **CO 4- App (16)**
- Or
- (b) Draw the circuit diagram of a current series feedback amplifier and derive expressions for voltage gain with and without feedback. **CO 4- App (16)**
20. (a) With a neat sketch, explain the working of an astable multivibrator. **CO1 - U (16)**
- Or
- (b) With a neat sketch, explain the working of an Monostable multivibrator. **CO1 - U (16)**

